GRINDING and FINISHING

JULY • 1959

IN THIS ISSUE:

- Techniques for Flat Polishing
- Grinding the Lick Observatory Mirror
- Dual-Purpose Blast Room Cuts Cleaning Costs

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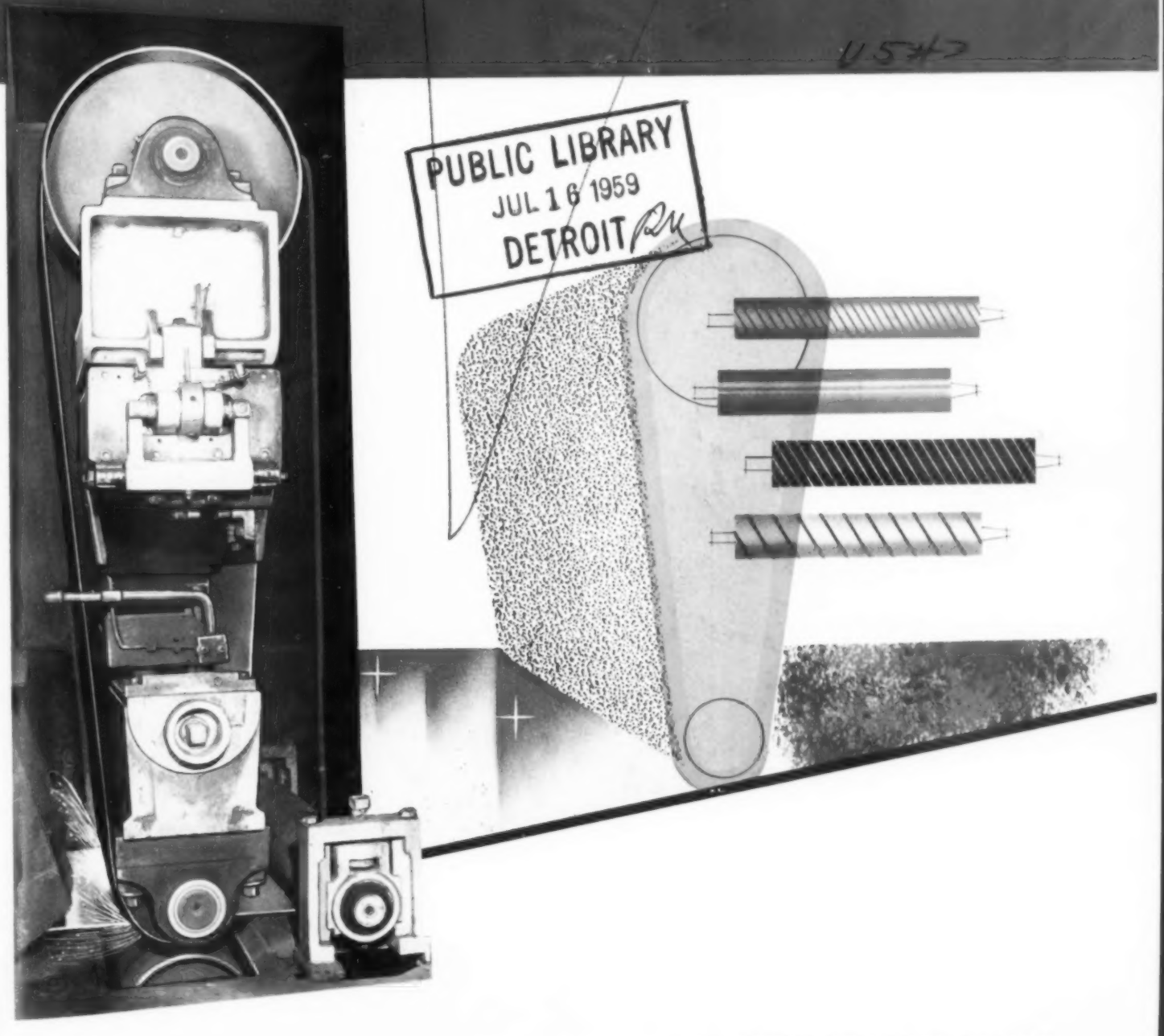

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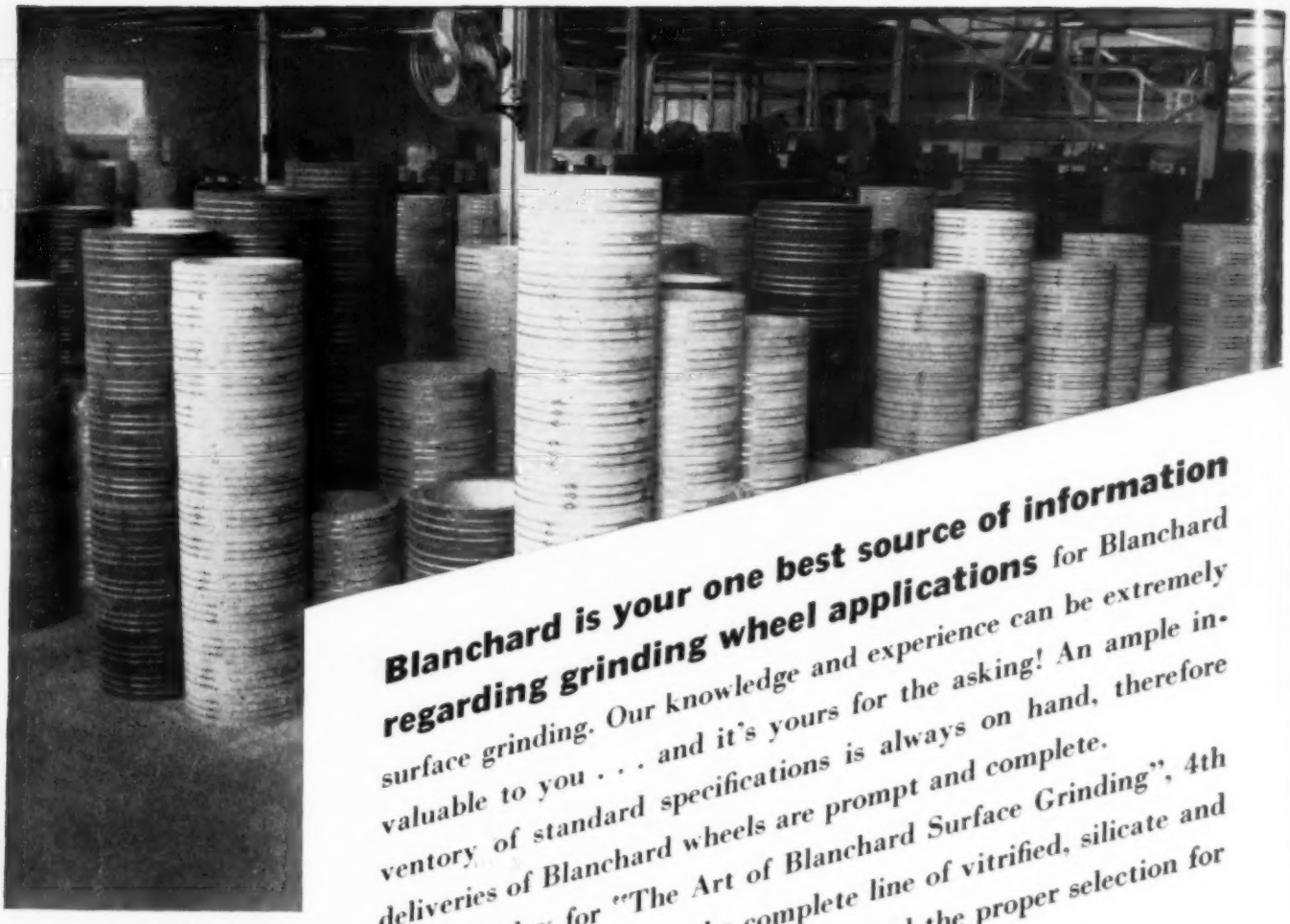

Blanchard is your one best source of information regarding grinding wheel applications for Blanchard surface grinding. Our knowledge and experience can be extremely valuable to you . . . and it's yours for the asking! An ample inventory of standard specifications is always on hand, therefore deliveries of Blanchard wheels are prompt and complete.

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THE BLANCHARD MACHINE COMPANY
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GRINDING and FINISHING

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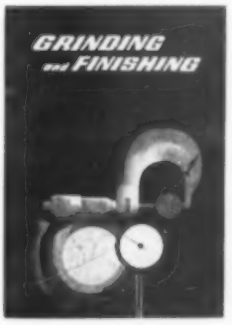
JULY COVER: By using a photo and art work the cover depicts the lead article in this issue. Flat polishing as any other manufacturing process has its area of skill and know-how. The cover highlights the areas covered in the article.

NEXT MONTH: the cover is a capsule presentation of measurement from ancient times up to the present, introducing the first of a series of articles on gaging for grinding.



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Cincinnati Filmatic No. 3

and New Ideas in Centerless T

Reduce Cost of Grinding Long Multiple Diameter Parts

It's time to take a new look at wide-wheel infeed centerless grinding. This low-cost method was developed by Cincinnati Centerless Specialists many years ago. The latest equipment illustrated here, covers a much wider range of parts. The machine is a new CINCINNATI FILMATIC No. 3 Centerless and the accessories incorporate the most modern ideas in centerless grinding:

Electro-hydraulic automatic infeed unit with a unique variation... dual rate feed control and adjustable time delay between feed rates.

Automatic magazine loading fixture, mounted on movable stand.

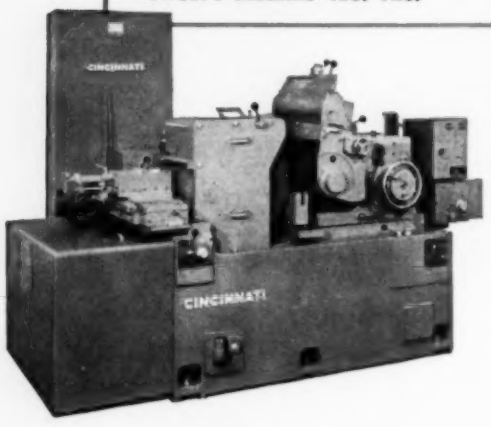
Disappearing end stop, for hydraulic push-through ejection of work.

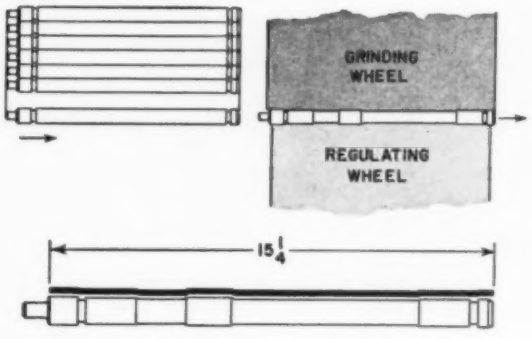
Accurate profile power truing for grinding and regulating wheels.

40 hp drive to the grinding wheel.

This type of CINCINNATI FILMATIC Centerless equipment gives your older wide-wheel grinding machines a high-cost rating which should be corrected now. And in addition, many multiple diameter parts, tediously ground one diameter at a time, can be Cincinnati centerless ground at a small fraction of their present cost. Our Centerless Grinding Specialists would like to show you what can be done. Get a copy of our catalog No. G-664-2 and then give us complete details.

CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. Catalog No. G-664-2. Brief specifications in Sweet's Machine Tool File.





Drawing of part and diagram of operating cycle. Heavy line indicates ground diameters. Stock removal, from solid, ranges from 1/64" to 1/16". Production 40 per hour at 80% efficiency.

BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CEN

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHI

Automatic magazine feed is coordinated with dual rate automatic infeed cycle and disappearing end stop for hydraulic loading and push-through ejection of work to rear of machine, a CINCINNATI FILMATIC No. 3 Centerless Grinder. Operation: grind long multiple diameter work from the solid.

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Pressurelok (the Performance Bond) makes the best of all Diamond Wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond usage.

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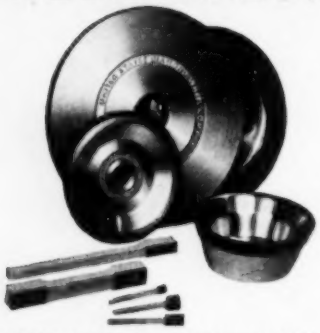

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This wheel is a precise duplication of your specification, warranteed when properly operated, to give you the lowest cost per cut of any wheel.

Write for our catalog No. 957 or call us at Aurora (Illinois) 7-9181 for "Progressive Specifications" on your job without any obligation on your part.

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Editor's Mail

Standards for Thread Grinding

There is an article entitled "Developing Time Standards For Thread Grinding," by Richard Paulson in the May, 1959 issue of the GRINDING and FINISHING magazine, pages 38, 39, and 40 which we are interested in. I am wondering if it would be possible to have 15 copies of same for use in our Design Cost Analysis Department.

If this is not possible, we wish to thank you anyhow.

C. E. Hamer, Manager
Design Cost Analysis Dept.
Tractor and Implement Div.
Ford Motor Co.
Birmingham, Mich.

Work and Wheel Speeds On Surface Conditions

We would very much appreciate the following reprint, "Effect of Work and Wheel Speeds on Surface Conditions," by J. A. Plusch. In passing, we would like to comment that GRINDING and FINISHING is becoming more and more interesting with each new issue.

Mario V. Mascioli
The Edmar Co.
Andalusia, Pa.

Abrasive Wheels Cut Chips

We are particularly interested in two articles which have appeared in your journal. They are: "Abrasive Wheels Cut Chips" by H. V. Allison, Feb., 1959, and "Installation of Coolant Cleaning Equipment" (Part III) by A. L. Wilson, June, 1958.

We should like to send these to a few of our members who are interested. If you could supply about a dozen tear sheets or reprints, we should be most grateful. Alternatively, would you please give us permission to photocopy the articles, providing due acknowledgment is given and copies are distributed free of charge.

E. A. Oldfield,
Supt. of Research
Cutlery Research Council
Sheffield, England

Control Reduces Tool Grinding Costs

We would appreciate receiving any tear sheets or reprint of the article: "Control Reduces Tool Grinding Costs" by Jules Caldwell appearing on pages 24 and 27 of the September 1958 issue of GRINDING and FINISHING.

C. Brusatori,
Works Manager
Fabbrica Apparecchiature Per Communicazion Elettriche-Standard
Milano, Italy

Finish Printed Circuits

We have noted with interest an article in the June, 1959 issue of GRINDING and FINISHING entitled "The Problem: Finish Printed Circuits" on page 30.

We would appreciate it very much if you would forward to us three reprints covering this article.

P. A. White
International Standard Electric Corp.
New York, N.Y.

Back Issues Requested

We should like to request you to send us the whole publication of the year 1958 of your technical journal, GRINDING and FINISHING. Besides we should like to order a second subscription to GRINDING and FINISHING and request you to send us the until-now published journals of 1959. We are also sending you U.S. $15 (for the publications in 1958 and for the second subscription of 1959, $7.50 each).

We should also like to ask you to send us the following reprints: "How and Why of Abrasive Wheels" by James Price and J. Biglin, "Raw Material Testing" by James R. Gilman, and "Developing Standard Time Data for Grinding Operations" by E. A. Cyrol.

Tyrolit Schleifmittelwerke
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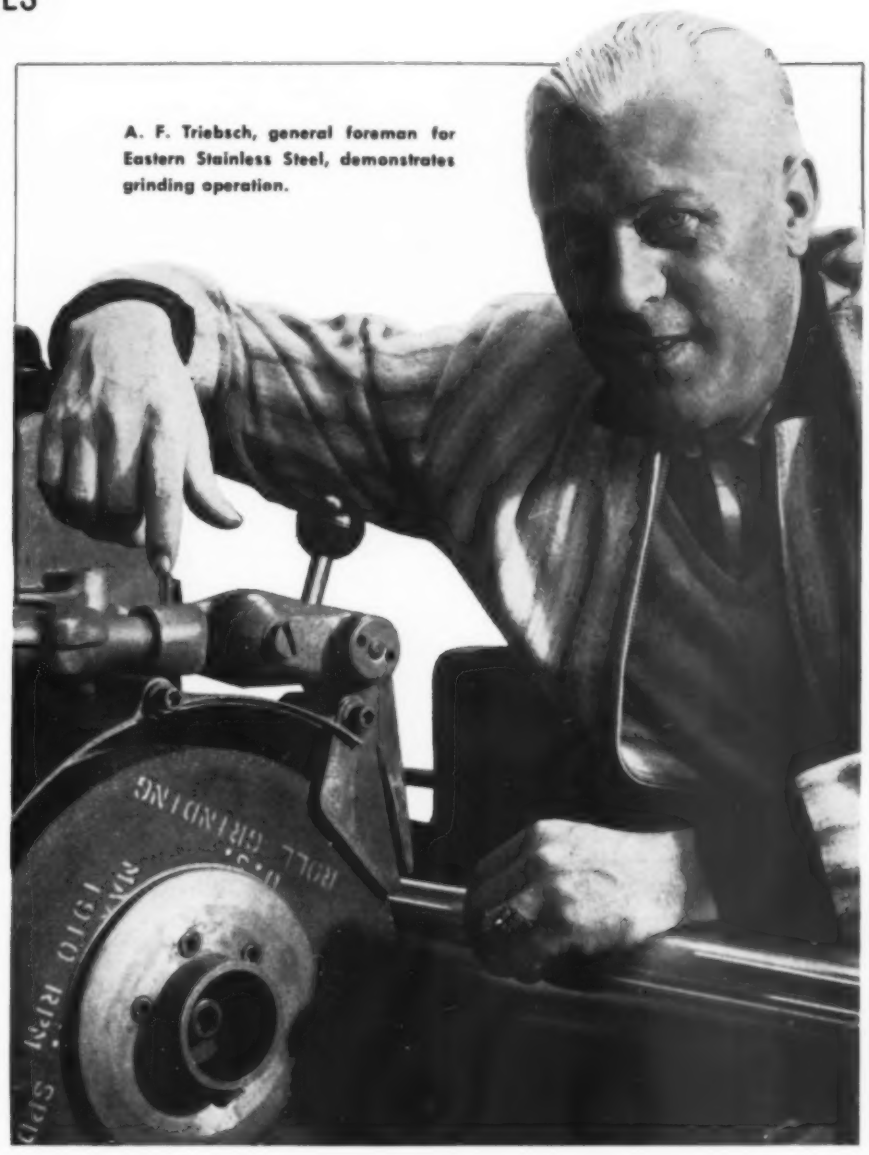
Schwaz, Tirol, Austria

GRINDING WHEELS



A. F. Triebsch, general foreman for Eastern Stainless Steel, demonstrates grinding operation.

Production UP 8%!

"U.S." Grinding Wheels help EASTERN STAINLESS STEEL achieve tolerances of 2/10 of .001" in precision work

In producing stainless steel of great precision, the steel passes through a succession of work rolls under a combined force of 59,000 pounds per square inch. All the rolls must be perfectly round and the tiniest defect must be eliminated. To produce a perfectly flat mirror finish, the rolls have to be 2/10ths of .001" perfect!

This is the kind of work Eastern Stainless Steel Corporation turns out every day. To keep their rolls in perfect balance and symmetry they use "U. S." Grinding Wheels. These amazing wheels allow for no "chatter" or vibration, consequently they never groove the roll. Prior to the use of "U. S." Grinding Wheels, at least an hour a day was lost when the operator had to readjust the machine.

Using "U. S." Wheels, Eastern Stainless Steel found many collateral advantages. Maintenance was reduced by more than 20%. "U. S." Grinding Wheels outlast conventional wheels at a ratio of 4 to 1, an obvious saving of 400%.

You, too, can effect important economies and achieve greater precision by turning your grinding wheel problems over to U. S. Rubber.

Mechanical Goods Division

United States Rubber

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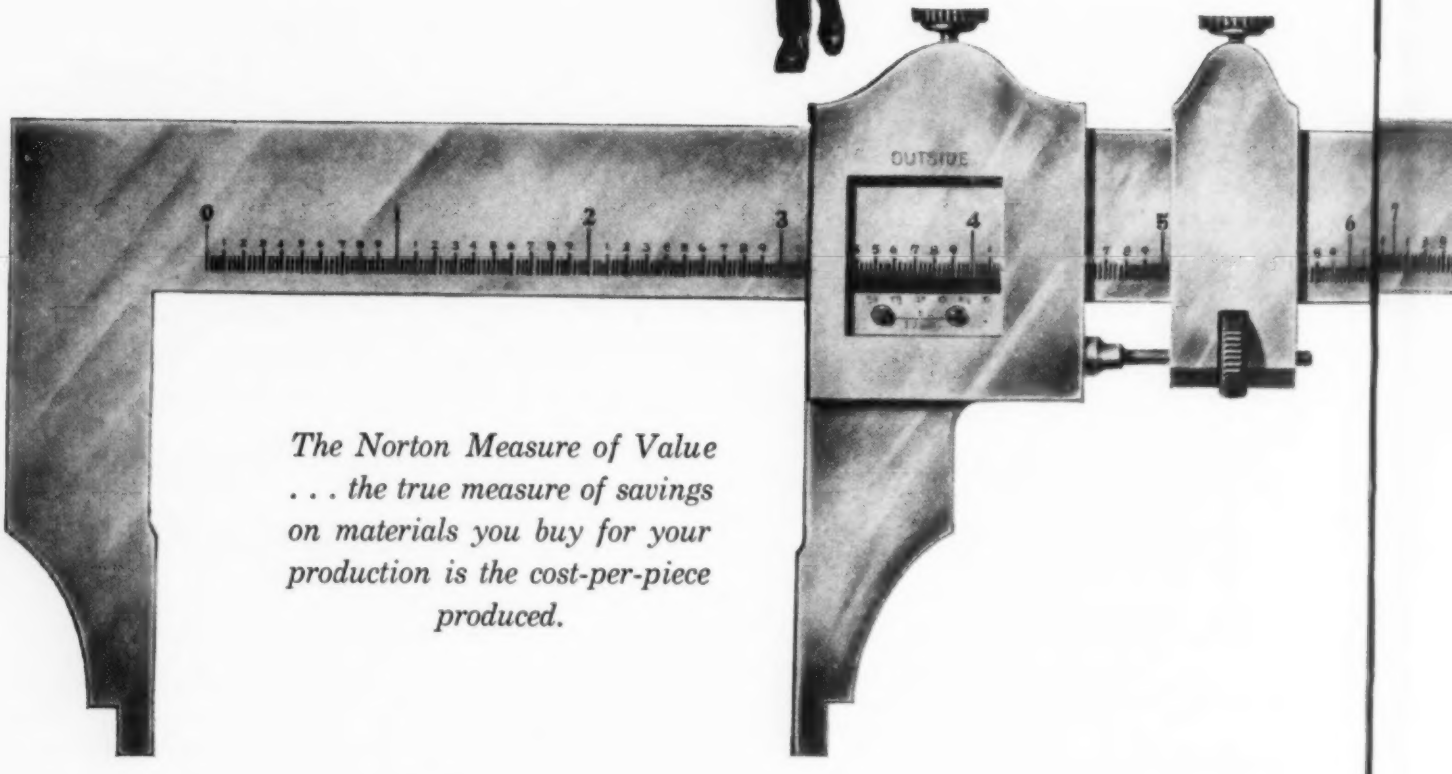
Call your Norton Man — he has the experience, the products, and knows how to save you money where it counts. There's a Norton expert in the fields of — abrasives, grinding machines, refractories.



The Norton Measure of Value . . . the true measure of savings on materials you buy for your production is the cost-per-piece produced.

Economists could argue the definition of the value of a grinding wheel in many ways. But it would usually come down to this — What is it worth to the purchaser.

You can buy less expensive grinding wheels than Norton wheels and save on immediate cost. But if the lower cost wheels do not perform their jobs efficiently or cause production delays because of poor quality or wheel misapplication — you haven't made a bargain — you've made a costly mistake.

The only accurate measure of the value of a grinding wheel is how much it produces for you per dollar cost — not merely how much you paid for it. Here is why Norton grinding wheels are worth more to you —

Norton Company gives you the most advanced research engineering and manufacturing facilities in the entire abrasive field — and you get this great scope of detailed knowledge on a personal basis — your Norton Man.

Every Norton Man starts his career by spending a minimum of one year in a carefully planned training course in the Norton plant and a comparable period of training in the field to assure a broad, thorough understanding of grinding before he goes "on his own." The average experience of all Norton Men in the field is 15 years in addition to their specialized training. The Norton Man is the most knowledgeable man in abrasives that you can consult. Make him your consulting abrasive engineer.

He will make an Abrasive Requirement Study for you.

You can produce greater savings than you can buy

This study lists the correct specifications for each abrasive job in your plant to assure you lowest cost-per-piece produced. He is also available for complete field testing on specific problems.

For example, your Norton Man can increase production by pointing out ways for better wheel usage and fewer wheel changes. He has the widest selection of grinding wheels in the industry from which to select the best wheel for new product grinding operations and for improving your current grinding jobs — both at the lowest cost. And with Norton grinding wheels you can be sure of precise duplication order after order.

Norton offers true abrasive economy. Economy that pays off in lower cost-per-piece produced. Call your Norton Man. NORTON COMPANY, General Offices, Worcester 6, Mass.

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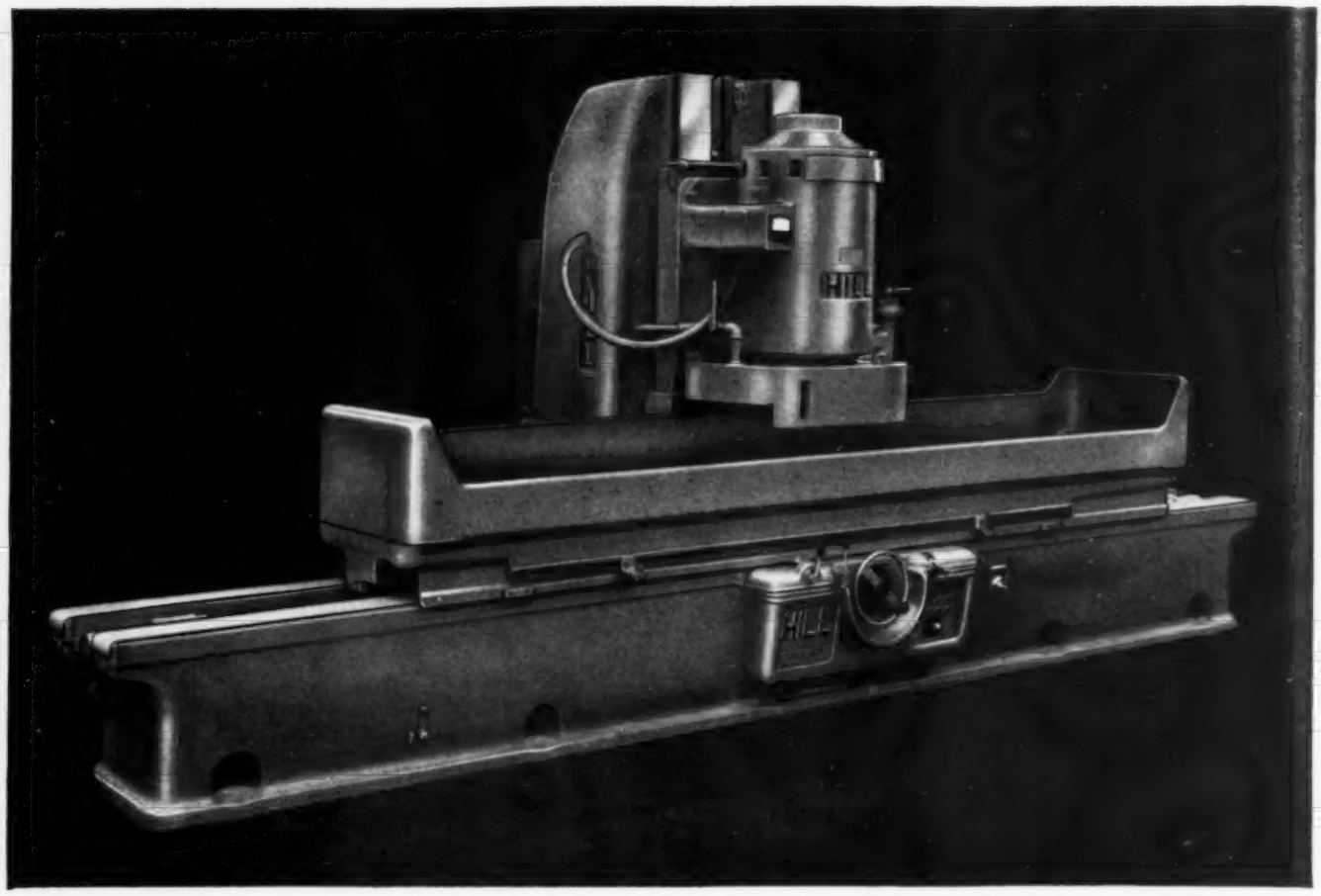
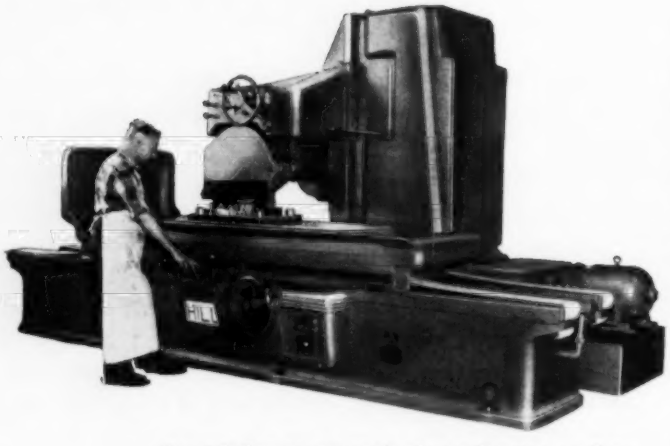


Hill Grinder ELIMINATES MILLING OPERATION



For grinding to extremely close tolerances on flats, angles, irregular and special shaped surfaces the HILL Horizontal Spindle grinder is recommended.

Expensive, time consuming milling operations can be eliminated in finishing die blocks, bolster plates etc. with the new HILL Vertical Spindle Hydraulic Surface Grinder. Equipped with either 75 or 100 HP main spindle motor, the segmented grinding wheel provides fast stock removal and produces an accurate finish in approximately half the time required for a combined milling and grinding operation.

The HILL fully hydraulic reciprocating table is adaptable to a wide variety of stock sizes having flat surfaces. Table widths are 18″, 24″ and 30″ with table lengths from 5 to 20 feet.

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Editor's Page

JULY 1959

Only One Way!

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There is only one way for machining operations to go. In speeches and conversations we have heard in recent weeks it has become increasingly apparent that machines must be designed to include more and more of the operator's skill. In the past years we have heard that the main reason for automation was to eliminate or cut labor costs. But this is not necessarily so. Technology of our present day industry has actually been just as responsible as the increase in labor costs.

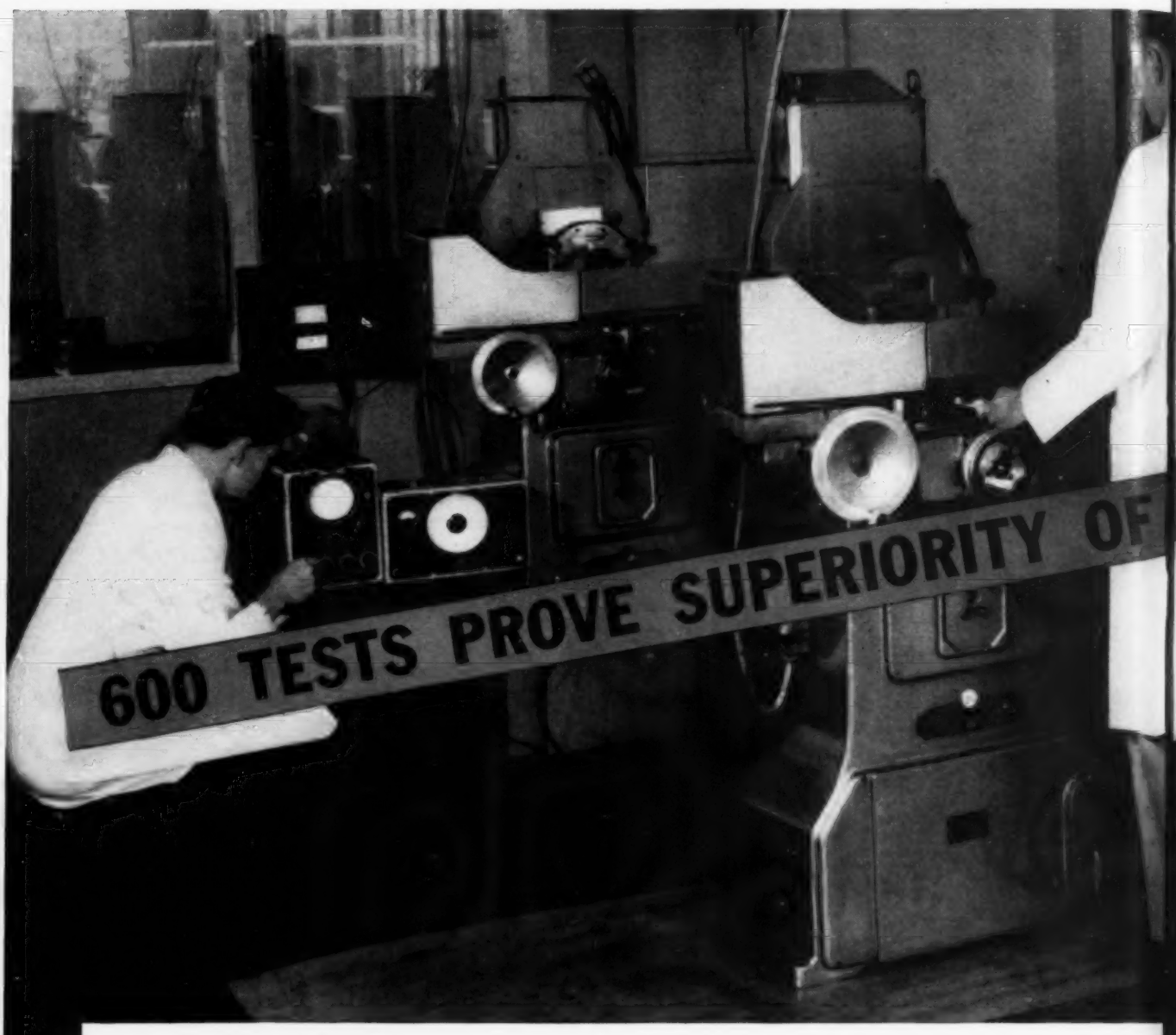
What operator can see, hear or feel one millionth of an inch? How can we expect an operator to locate consistently one part after another to millionths? How many operators are skillful enough to determine less than 10 RMS? These are the operator functions which must be built into the machine. Even with the larger labor force in this country we can not possibly keep up with the demands of the American consumer. This is the consumer who prefers using a $30 mixing machine and a $5 attachment to squeeze orange juice to the fifteen cent hand squeezer. These are the consumers who read every day about atomic transportation, rockets, missiles and other technical advances. The American consumer demands huge quantities of mechanical, precision equipment.

To answer these demands there is only one way to go. It is true that we have also seen some cases in recent months of the automatic machine being abandoned. But in every case it was not a precision operation and the lot size did not warrant the expense of change over or maintenance. It should be noted also that in every case it was apparent that a machine will be developed which will not need down time for a change over and will not be so complicated as to cause expensive maintenance.

Precision and quantity are the reasons we must build more of the operation into the machine. The opposition to this change is large but I must admit a failure to understand their reasons. Let's look at the economic side of this picture, which is where we always seem to end in this discussion. First and most important, there would be no need to build automation and operator skill into the machine if there weren't a demand. As long as we have this demand there will be more and more automation. As this automation increases there will be an increase in need for marketing personnel. More dealers, representatives, stores, wholesalers, etc. will be needed to handle the increase in productivity resulting from automation. The circle is then complete. The production has been demanded, the manufacturer has produced with less man power while increasing the need for man power for marketing. This circle follows the same pattern as the circle of Free Enterprise. It is the only way!

M. M. Patterson

Managing Editor



30% TO 50% LONGER LIFE FOR RESINOID-BONDED DIAMOND WHEELS

Six hundred separate trials, using 145 wheels, were run by the Diamond Research Laboratory to test a completely new type of natural diamond grit for resinoid wheels. The results: this new grit increases the life of natural diamond resinoid-bonded wheels by 30% to 50%.

The particles of this new grit do not readily pull out of the bond. Instead, they break down into ever-finer fragments which constantly expose new, sharp cutting surfaces.

TEST EQUIPMENT: Three 18" Jones & Shipman production grinders were fitted with special spindles to enable wheels to operate at 5500 surface feet per minute, the speed generally used in diamond grinding.

The wheels were of the D1A1 type, 6" in diameter, 3/16" face width, with 1/8" depth of resin. Each wheel contained 31 1/4 carats of the new grit. Metal to be ground was tungsten carbide of the same quality normally used for milling cutters, lathe tools, etc. During the course of the tests, 700 pounds of hardest carbide were ground away.

RESULTS: This new friable grit, Selected Natural Diamond (SND-RESINOID), increases the life of natural diamond resinoid wheels by 30% to 50%, depending on the type of job at hand. The grit will be available to your wheel manufacturer soon. Next time you order diamond resinoid wheels, specify SND-RESINOID . . . the most economical *and* the most efficient grit you can use.

Tests were run on these three Jones & Shipman production grinders. Results showed that the new grit, Selected Natural Diamond (SND-RESINOID), increases the life span of natural diamond resinoid wheels by 30% to 50%.

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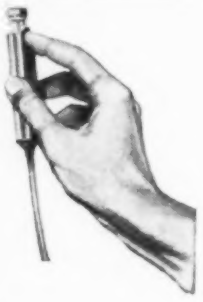
Brush Surfindicator



The Brush Surfindicator can increase your tool life *up to 50%* by setting microinch specifications on

(1) The *cutting edge* of the tool for optimum cutting efficiency.

(2) The stock surface to arrive at the most efficient cutting *angle* of the tool.

(3) The surface finish to determine exact *point* in the production run at which to *replace* the tool.

Your production runs can be lengthened—machine shutdowns and rejects reduced—your quality maintained with the Brush Surfindicator.

A demonstration can be arranged in your plant. Call us—set a date—we'll be there!

brush INSTRUMENTS
DIVISION OF
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Grinding Safely

RICHARD L. McKEE • Associate Editor

Off to a Good Start

● Few events are more dramatic than the start of an Indianapolis "500." It is the climax of thousands of hours of planning and work—but a lot of it could go down the drain simply because someone forgot or omitted some seemingly insignificant last-minute detail.

In comparison, starting a grinding machine is a routine thing, more like getting the family bus under way. It is done thousands of times every day, without incident. Everything goes off smoothly. But like the racing car or the family chariot, the grinding wheel has a number of things to be checked if the start is to be safe. . .

• Make sure the work rest is properly adjusted—at or above the center of the wheel, and no more than ⅛" away from the wheel.

• Check to see that the wheel guard is in place.

• Stand away from in front of the grinding wheel while starting the machine.

• Allow any newly-mounted wheel to run at operating speed with the wheel guard in place for at least one minute before starting to grind. • • •

Parade lap preceding the start of a recent Indianapolis "500." Many of the points which have been checked on these cars seem to be as simple as those listed above for grinding wheels, but omitting them could be costly and perhaps fatal.

● ACTUAL MANUFACTURERS OF RESINOID METAL AND VITRIFIED DIAMOND WHEELS UP TO AND INCLUDING 20" DIAMETERS

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Metalworking in General

Coolant Manufacturers Need Good Laboratories

Coolant manufacturers "must have adequate laboratory facilities and qualified technical personnel if they are to fulfill their responsibility to the metalworking industry." This was a key point made in a paper delivered before a meeting of the American Society of Lubrication Engineers in Buffalo, N. Y., prepared by E. D. Kitzke and R. J. McGray of the Research and Development Div. of Johnson's Wax, Racine, Wis.

The paper suggested five possible steps the coolant manufacturer should take before introducing a new product: (1) Determine its degree of resistance or susceptibility by bacteriological means in the laboratory; (2) Study reformulation opportunities to improve any adverse conditions; (3) Consider additives to the formula which will serve as a protectant; (4) Consider additives under field use conditions which can function as "shock" treatments which will solve localized problems should they occur, and (5), Develop field use practices designed to keep the product functional and free of trouble.

Stainless Steel Clad Bumper

Barbara Hughes, a secretary at Allegheny Ludlum Steel Corp., Pittsburgh, is shown with a stainless steel clad bumper, made of Type 301 stainless steel. This bumper, which has been field tested for more than two years, is still found to be in excellent condition. Stainless steel clad bumpers eliminate pitting and peeling, and one like it may someday be on your automobile.

14-Man Committee Studies Materials Research Progress

Dr. Detlev W. Bronk, President of the National Academy of Sciences-National Research Council, announced the appointment of a 14-man Committee on the Scope and Conduct of Materials Research in the United States to accelerate efforts to meet the increasing demands of industrial progress and national defense.

Dr. Clyde Williams, President of Clyde Williams and Co. of Columbus, Ohio, is Chairman of the Committee.

Lehigh University Opens Mfg. Processes Laboratory

Lehigh University, Bethlehem, Pa., has opened a $100,000 manufacturing processes laboratory, the third workshop area provided through funds contributed to the 1957-58 annual giving fund. The new equipment is housed in an area on the ground level of Packard Engineering Laboratory.

Universal Measuring Microscope

A Ziess universal measuring microscope, purchased by The Timken Roller Bearing Co., Canton, Ohio, is capable of making measurements on a great variety of gauges. For instance, it will check a tool profile gauge having as many as 15 measurements and 8 angles in 15 minutes. The operator is shown checking dimensions of a tool profile gauge that can be seen in the center of the stage. Beneath the operator's left hand are the push buttons which change the various scales.

ALOXITE BRAND VITRIFIED BY CARBORUNDUM
REPORT
PART—Input Shaft (58 Rockwell "C" Hardness)
OPERATION—Grind grooves in blank
PROBLEM—Maintain close radius in groove base
SOLUTION—Standard thread wheel by Carborundum, AA80-K VT
RESULT—Substantially increased output
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You Asked . . .

ARTHUR RAKESTRAW
Contributing Editor

Developing Time Standards for Centerless Grinding

● What are some of the points to be considered in developing time standards for "units of grinding wheel substance expended per volume of metal removed —specifically for the centerless grinding of hot rolled bars"?—R. B. Midland, Pennsylvania.

We assume that you are interested in establishing production rates on your centerless grinders, taking into consideration the amount of material removed per pass and the associated abrasive wheel wear.

Such time standards are quite common on operations like automotive wrist pin production, where the rough product is rather closely controlled for size and quality. Some difficulty might be expected in your problem, because of the wide variation as to rod size and the character of the rough rolls, unless the rod is processed through a straightening operation.

In order to establish time standards from the first roughing pass to the finished product, it may be necessary to go into considerable testing, standardizing on a single abrasive grinding wheel and preferably on one rod size for each test. The amount of rod reduction per pass and the rate of through feed can be varied for each rod size. From this data the most economical procedure can be found. Measurement of the abrasive wheel at the start and after each test run will make possible the calculation of the volume of abrasive consumed. The total amount of material removed in any one test can be calculated from the amount of rod reduction and the total rod production during the test run.

When the most economical condition has been determined for each rod diameter which requires a different machine set-up, it will be possible to establish definite conditions such as maximum infeed per pass, regulating wheel speed and angular setting.

It would, of course, be desirable to select the most satisfactory abrasive wheel specification that can be found before setting up piece rates based on these standards, as there could be a considerable variation in the results obtained from abrasive wheels from different sources.

Tool Grinding—Vitrified or Silicate Bonded Wheels

● What would be your suggestion for a vitrified bonded wheel to produce the same results as a 120 grit aluminum oxide silicate bonded wheel for tool grinding?—K. A. Birmingham, Alabama.

We presume that this wheel is used on some form of off-hand wet grinder and may be the result of converting from a sand stone operation. It is a finer wheel than is customarily used, therefore you must have a good reason for using it.

The grinding action of a silicate bonded wheel cannot be duplicated by a vitrified wheel due to the difference in bond strength. Wheels are available however in a vit-silicate bond which is a combination of the two. These wheels will give the approximate action of the silicate bond while being more uniform in structure and grade. The grade of the wheel would be about J.

Segments for Grinding Cast Iron

● What specification of segment would you recommend for grinding cast iron motor bases on a vertical spindle, rotary table surface grinder?—J. R. Kalamazoo, Michigan.

The specification of the segment would depend largely on the character of the motor base surfaces and the required finish.

Narrow ribbed surfaces might permit the use of a slightly harder grade. However, if one side of the casting is ribbed and the opposite side more or less flat, it would be necessary to favor the broader surface and use the softer grade.

There are some manufacturers who have available types of aluminum oxide abrasives possessing very sharp abrasive grain characteristics that make this type particularly well adapted to the surface grinding of cast iron.

However, because of the more popular use of silicon carbide abrasive for cast

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iron, we recommend its use in grit sizes 24 or 30. The grade of the segment, depending on the rim width of the segment and the extent of the ground surfaces, would be in the neighborhood of grade H or I. Vitrified bond.

A light dressing of the segment wheel to remove any surface loading and to present a sharp cutting rim, together with light down feed, should produce a satisfactory work finish.

Regrinding Magnetic Chucks on Surface Grinder

● What kind of grinding wheel should be used for regrinding the magnetic chuck of a surface grinder? How often should this be done, and what are some of the precautions which need to be observed in doing it?—G. G. Pittsburgh.

Opinions vary as to the type of abrasive wheel and the method of reconditioning the surface of magnetic chucks. If proper care is exercised in handling work pieces on the chuck, to eliminate damaging dents and scratches, reconditioning would be required at very infrequent intervals. Of course, it is necessary to take a very light exploratory cut over the surface of the chuck whenever it is assembled on the grinder table after having been removed.

Some operators are partial to surface grinding the chuck with abrasive wheels of silicon carbide abrasive, while others use whatever specification is available for broad surface contacts.

Some operators are of the opinion that the chuck should be energized when the reconditioning is performed, the idea being that this would eliminate possible distortion.

Regardless of the type of abrasive wheel used the wheel face will become loaded with particles of lead around the magnet poles, causing chatter. The face of the grinding wheel should be frequently dressed to remove this load accumulation and present as sharp a cutting surface as possible.

Magnetic chucks should be thoroughly cleaned and greased when not in use or when removed from the grinder. A protective covering such as a piece of masonite or a wood board placed over the chuck surface when the chuck is not in use will safeguard it against damage from other metallic objects.

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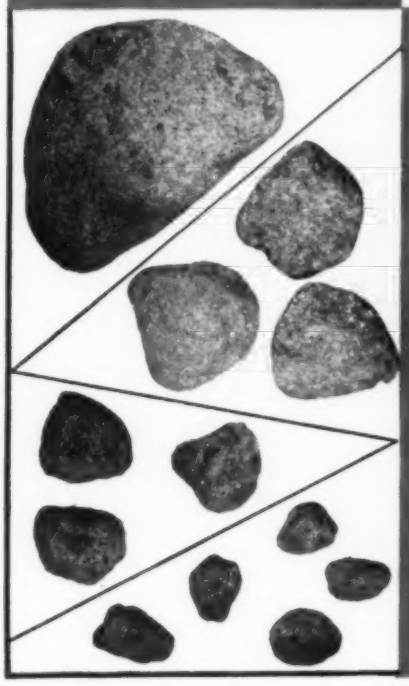

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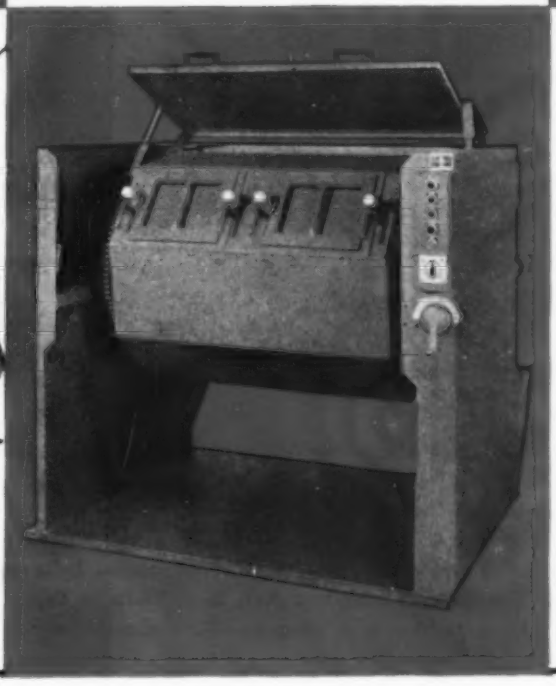

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TECHNIQUES in flat finishing

By THOMAS C. SMITH
Product Engineer
Behr-Manning Co.

This article is written to provide you with a check on your techniques of flat polishing in the areas of correction of defects in the sheet metal, application of lubricant and selection of contact rolls. The coated abrasive belt is the key to any flat polishing operation; however the three areas covered here can greatly enhance the quality and reduce the costs of flat polishing.

● Good techniques in flat polishing of wide metal sheets in the three areas of recognition and correction of defects in the sheets, application of the lubricant and selection and use of contact rolls can be of great benefit to the processor. The proper belt selection is without doubt the key to flat polishing but even the right belt cannot be used to the best advantage if these other areas are not properly treated. Both quality and cost will be affected by: poor evaluation and elimination of defects in the sheets as they are received, improper application of greases and oils and misguided selection, use or care of contact rolls.

Inherent in hot or cold rolling of wide metal sheets are several types of defects. In the case of stainless steel these defects not only create a scrap problem, but may even prevent the use of the material for architectural decoration or where sanitary conditions are required.

These surface blemishes are of several basic types such as marks resulting from improper handling, as illustrated in Figs. 1, 2, and 3 or resulting from the rolling process as in Figs. 8, 9, and 11.

Recognition of these defects and the operator's estimate of their probable depth are important before the grinding and polishing procedure can be started. Major defects as shown in Fig. 2, would probably run .015-in. deep; their removal by grinding would require taking too much stock off the entire surface of the sheet to be economical. Likewise, in Fig. 1 this defect would probably run .005 to .008-in. deep and still might not be economical to remove. In this case, the first option for the operator is to flip the sheet over and examine the other side to see whether its condition is any better. Usually there is a preferred side available. Only in rare cases does production scheduling warrant going after such deep defects by grinding.

Where conditions force the use of such a bad surface condition, grinding must begin with very coarse belts of 50-grit aluminum oxide or coarser. Belts in this case should be bonded with resin-over-glue for additional aggressiveness and better belt life.

In the case of shallower defects as in Figs. 7, 8 and 9, polishing would start with an 80-grit aluminum oxide, glue-bonded belt. In this case we want to remove the defects without introducing the aggressively deep scratch pattern resulting from the use of a resin-bonded belt; such a pattern requires more work in the final polishing operation to remove.

In both cases, initial removal of the defects is followed by progressive passes with the finer grits in sequence.

Frequently, after the initial passes have been made on sheets which appeared to be in good surface condition, grinding will have exposed voids which lay below the surface and will now show up in the sheet surface as illustrated in Figs. 4, 5 and 6. Note the widely scattered condition in Fig. 4 and the concentrated grouping in Fig. 5. Additional grinding with the coarse grit selected is necessary in both cases before progressive grain passes can be made. Fig. 10 indicates the same sheet surface after three more passes had been made. The pits are now eliminated and polishing can proceed.

In the case of an all-over surface condition such as Fig. 4, the sheet must be ground over its entire surface. However, in the case of a grouping of defects such as Fig. 5, the use of "spot padding" can save the operator several extra passes as well as reduce the amount of material which would normally have to be

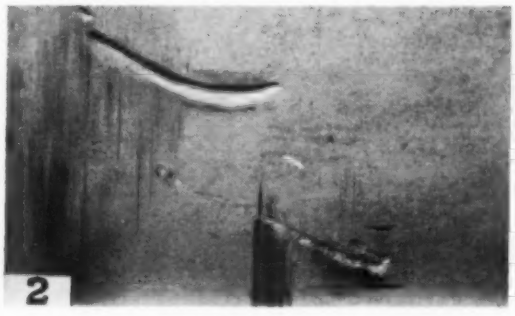
Figs. 1, 2, 3 show surface blemishes resulting from improper handling.

Figs. 7, 8, 9, 11 show surface blemishes resulting from the rolling process.

Figs. 4, 5, 6 show voids which have been exposed after the first grinding pass.

Figure 10 shows a sheet after additional rough grit grinding has removed the blemishes and polishing can be performed.

1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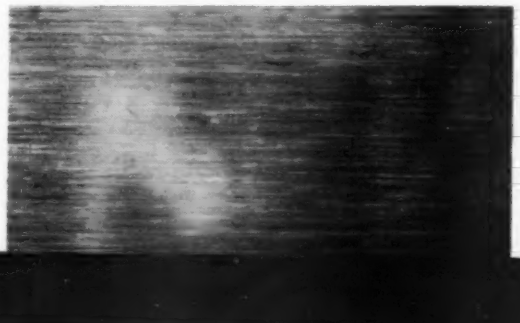

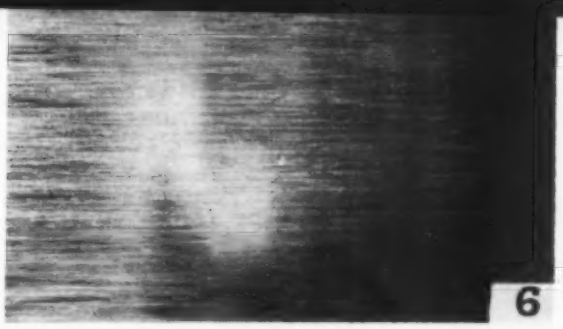
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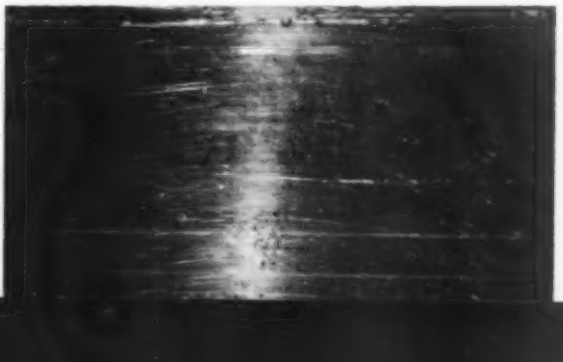
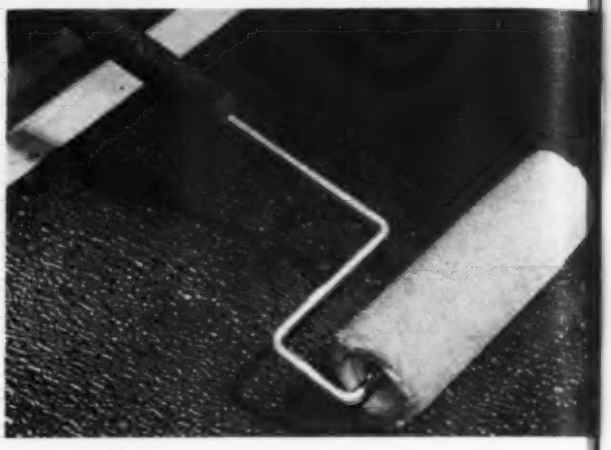


Fig. 12 (below) a strip of paper is being laid out so as to be placed under the steel in order to remove a defect in a small area.

Fig. 13 (right) seam defect can be removed by placing folded sheets of paper under the defected area.

Fig. 14 (lower right) short nap roller will provide the most uniform application of lubricant.



removed from the entire surface of the sheet. This spot padding is illustrated in photograph Fig. 12. The operator has folded a strip of kraft paper, such as is wrapped around the abrasive belt in its shipping container, into a section of four or five thicknesses. This strip is laid on top of the sheet with the pad over the defect and its distance from the edge of the sheet marked on the strip by holding it against the edge of the sheet. The sheet is then raised and the strip slid under it on top of the carrier sheet. The protruding end of the strip is then torn off. One or two passes with this pad under the sheet result in concentrated grinding in the immediate area of the defect, and removal is accomplished more quickly than by increasing pressure over the entire sheet. After the defect is removed the pad is withdrawn and one pass over the entire sheet blends the surface around the defect. Where the grouping of defects is larger than a circle of 2-in., a larger pad, even 10 x 10-in., can be laid under the sheet and used for spot removal.

Where a seam defect is noted, a "strip pad" can be used as indicated in Fig. 14. Here the operator has simply folded several sheets of kraft paper into a long strip. This concentrates the grinding pressure in the area wherever the strip is laid down. In this case the operator is working on an edge defect which often occurs when lamination is observed along the edge of the sheet. It may be due also to the sheet being slightly heavier gauge in the center, with thinner edges. The strip pad can then be used along the edges of the sheet to build this up and clean this area before removing the pad and blending with the rest of the sheet surface.

APPLICATION OF LUBRICANT

In grinding and polishing operations, the use of oils and greases on the surface of the belt has been a standard practice for years. From all this experience many basic procedures have been derived to attain the best results. Because the haphazard application of such materials in the grinding operation can seriously affect surface uniformity, these techniques have been improved with passage of time. For example, the application of oil to the face of the belt has been accomplished for some time by dipping a long-handled brush in oil and then smearing it across the face of the sheet being ground. As the sheet passes under the belt, naturally this oil is picked up and spread over its face. Application with a brush unfortunately can result in gobs of oil in some spots with only thin films in other spots. This results in an uneven pick-up of the oil on the face of the belt and an uneven "head". Naturally, streaking of the sheet results. The preferred method developed recently is to apply the oil by means of a paint roller such as in Fig. 15. Ordinarily this is a short nap paint roller approximately 1-ft. long. The roller has several distinct advantages over the brush application: it spreads a more even film with each pass across the sheet and also covers a wider area with each pass, resulting in faster application. In some cases two rolls are ganged together on a common shaft and 2-ft. of surface is covered in each pass.

The type and viscosity of oil used are of utmost importance. Several basic rules should be kept in

mind. First, in the coarser grits (120 aluminum oxide and lower) thin or low viscosity oils of 100 SS at 100F are used. These provide a washing action on the face of the belt which prevents swarf from adhering. In the case of non-ferrous metals these oils are pretty much restricted to straight mineral oils with fatty additives to prevent any possibility of staining. In the case of ferrous metals, however, advantage can be taken of sulphur chlorinated oils in the heavy grinding passes. The presence of the sulphur and chlorine actually overcomes the tendency of metal particles to weld to the individual grains on the face of the belt. This is a particular hazard under the heaviest grinding conditions. Where extremely heavy grinding is being attempted with proper machinery, the oil must be introduced in flooding quantities.

As the surface is advanced through the finer grits such as 120 and 150, a slightly heavier bodied oil is used in order to retard the cutting action of the belt by preventing the deep penetration of individual grains into the surface. Going higher than grit 150, it is possible to apply oil films which are too heavy for the grain even to penetrate; such a film will not allow the belt to touch the sheet surface. In these cases, the oil must once again be thinned out. Often this is accomplished simply by adding kerosene. However, selection of the proper oil blended to the correct viscosity is preferred. Viscosity should be 70 SS or even lower at 100F.

Where oil even of reduced viscosity still prevents the grain from penetrating to the sheet surface, it is often necessary to abandon the roll film application and resort to spraying the oil on the surface.

For polishing with extremely fine grit belts of 180 and finer, the application of grease as a "heading agent" is often preferred. As with oil, care must be taken in choosing the proper grease as there is available a wide range of straight fatty oil type greases as well as sulphur chlorinated greases. In the case of narrow belts, 1-ft. wide or less, the grease often can be applied directly to the face of the belt and smoothed within reason. However, in the case of wide belts in the range of 4-ft and 5-ft or more, the grease is best applied to the surface of the sheet. Note that the grease stick has been removed from its cardboard container so that its side can be rubbed over the sheet covering a wider area with each pass. Naturally, care must be taken to prevent "gobbing" or heavier coating in one place than another. If properly applied in this manner, the grease will be picked up and spread evenly over the face of the belt. On non-ferrous metals, non-sulphurized greases should be used, such as thinner bodied, lower melting-point greases that will not gum, stain or load the surface.

In the very high grits of fine finishing such as 320, an application of properly bodied greases can even create a burnishing action where it is desired.

The distinct advantage of both oils and greases as grinding and polishing agents on coated abrasive belts lies in the fact that they can be used with all types of belts. Even the least costly glue-bonded paper-backed belt is generally unaffected by the oil application within the economical life of the belt.

SELECTION AND USE OF CONTACT ROLLS

Of all the factors affecting the performance of a coated abrasive belt, the most important other than the belt itself is the contact roll over which it is run. Unlike the hand grinding and polishing operations, wide belt coated abrasive machines cannot be controlled by sight or feel of the operator. As a result, many jobs are run with improperly selected contact rolls which merely do the job, but with poor economy. Actually the contact roll determines the belt's rate of stock removal as well as quality of finish which will be possible.

The proper selection or design of contact roll immediately becomes important not only because of these two factors, but also, because the roll itself represents an investment of $500 or more, errors become costly to correct. Secondly, proper roll selection can reduce the number of rolls required to perform an operation. Lastly, proper selection will limit the number of roll changes required during machine operation, thus saving expensive down time.

Before we can properly select a contact roll design, we must analyze the features that determine the roll's performance. These items are (a) hardness of the roll covering, (b) the angle of serration, (c) the ratio of lands to grooves, (d) the diameter of the roll. These different features of a contact roll are illustrated in Fig. 12.

The material most generally used is rubber because of the ease with which its density can be varied from very hard to very soft. It is usually rated by means of the Shore meter which rates soft rubber with a low value, 50 and below, and hard rubber with a higher value, 50 up to 100. The rubber is also used because it can be relatively easily ground to a true cylindrical shape and can easily be machined for serrated designs.

As shown in Fig. 15, the angle of serration is measured from the end of the roll and could range from zero to 90 degrees. To understand the importance of angle, we must first understand the reasons for and advantages of serrations.

In Fig. 16 we have an enlarged cross section of a serrated roll, showing how it backs up a belt at its point of contact with the material being ground. Note that for an instant the belt has no support from the roll, and the abrasive is not forced sharply against the work. This is followed immediately by the impact of a land suddenly backing up the belt and pounding the abrasive down into the work. This added impact increases the cutting action of the belt tremendously. Of course, the speed of the belt is set so that these impacts follow each other rapidly and the stock removal becomes continuous.

Fig. 16 shows also that if these grooves are cut at an angle of 90° or along the axis of the roll, they would cut chatter marks into the sheet surface much like the teeth of a gear meshing with a gear rack; moreover, a wheel with serrations at this angle would be extremely noisy.

Numerous shop tests have shown that maximum advantage can be taken of the impact of the serrations, while the chatter marks can be reduced considerably

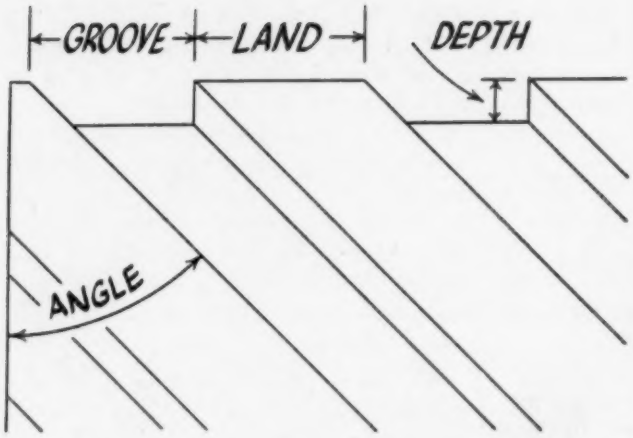


Fig. 15

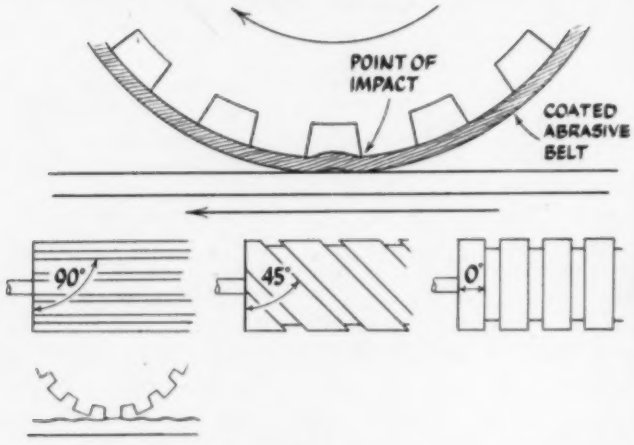


Fig. 16

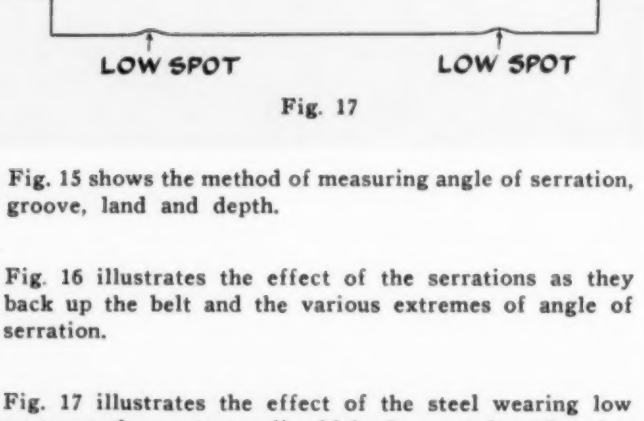


Fig. 17

Fig. 15 shows the method of measuring angle of serration, groove, land and depth.

Fig. 16 illustrates the effect of the serrations as they back up the belt and the various extremes of angle of serration.

Fig. 17 illustrates the effect of the steel wearing low spots on the contact roll which then requires dressing the machine.

if this angle is reduced to 45°. In this position the serration wipes across the surface at an angle rather than impacting as sharply as at 90°. It can readily be seen that at the other extreme, if this angle were reduced to 0° and the grooves cut parallel to the end of the rolls, striping of the sheet would occur. The minimum desirable angle which will permit the wiping action without striping has been proved to be about 8°.

Understanding the effect of serrations it can now be seen that the more lands or flat surface areas there are on the roll, the less impact effect the roll will have, and the less aggressive its action will be. On the contrary if we decrease the ratio until lands and grooves are equal, maximum aggressiveness is obtained.

Generally speaking, the smaller the roll diameter the more aggressive the action. The larger diameter rolls tend to improve finish, all other factors being equal. Because the weight of rolls 4, 5, and 6 ft in length increases so rapidly, the diameter must be held within reason to limit stress on the supporting framework of the machine. Experience has developed a good average diameter of about 8½ in. which is sufficient to prevent deflection in the roll itself and yet does not require tremendously oversized supporting frameworks for the outboard bearing. However, for finishing purposes 12-in. diameter rolls are often introduced.

The diameter is also important in that it determines the depth of rubber covering which may be used over the steel core. Usually this is a minimum of ¾ in. or 1 in. on the radius, or 1½ in. on diameter. This depth of the rubber covering will affect its resiliency as well as determine the depth to which grooves can be cut. The depth of grooves is important for two reasons: first, it determines the number of times the roll can be re-dressed without losing its effective serration design and secondly, in the softer rolls it determines the tendency of the edge of the land to "cave."

For example, a roll has been made of 90 durometer rubber with the grooves cut at an angle of 45°. Grooves and lands are each 5/16-in. wide, a ratio of one to one. This is the most aggressive roll because of the maximum hardness, the angle of serration, and the land: groove ratio.

A roll of 25 durometer rubber with a serration angle of 8°, lands of ½ in. and grooves of ⅛ in., or a ratio of four to one. This is a fine finishing roll because hardness is reduced to the minimum, with a maximum ratio of land to groove.

A roll of solid steel provides maximum hardness. Its surface has been knurled, then ground lightly to remove the sharp tips. The purpose of knurling is to provide adequate grip to drive the abrasive belt during wet operations. This is a special purpose roll for stock removal on sheets which are already reasonably flat; such a roll cannot follow the normal variations in rolled metal surfaces.

Two intermediate rolls represent variations in angle hardness and land: groove ratio, and are in-

teresting for their illustration of compromise design.

To understand design selection fully, we must understand the steps necessary to be considered.

ROLL SELECTION

The points to be considered in proper roll design selection follow:

a. What is the operation? Stock removal, polishing or a combination of both?

b. What is the type of material? Ferrous, nonferrous, hard or soft?

c. What is the rate of production? Ten a day or 1000 a day?

For example, if the operation is one of maximum stock removal on a relatively hard material such as stainless steel, the selection of a most aggressive design is clearly indicated—the 90 durometer, 45° one-to-one serrated roll. However, this same job of stock removal on a softer material such as aluminum or brass would require a design with less aggressiveness, because the harder roll would leave intermittent chatter marks in a softer material. This condition calls for a less aggressive roll with reduced angle, lower durometer of 65 and a ratio of two or more to one.

If this same problem is attempted on an extremely soft material such as zinc or copper, the aggressiveness of the contact roll must be reduced even more by specifying smaller angle, lower durometer, and higher ratio of land to serration which would mean a much reduced rate of stock removal. The first stock removal pass may be made with a semi-aggressive roll followed by finishing passes with an extremely soft finishing roll of 25 durometer, 8° spiral, and a four to one ratio of land to groove.

If the problem is one strictly of polishing, then the soft finishing roll alone can be used for all passes even on the harder materials.

Suppose now that our problem is one not only of stock removal but of polishing as well. We now have a combination operation. At this point we must consider the rate of production. If only 50 units a day are involved, a one-machine operation is indicated. To use two separate rolls, one for stock removal and one for finishing on a single machine, requires down-time for changing rolls between operations. Obviously a compromise contact roll design is indicated—one which will permit us some aggressiveness of cut, but also allow us to do the finishing operations required. We can now see the advantage of compromise design. For a hard ferrous material we could use a compromise of 30° to 35° with a durometer of 60 to 65 and a land: groove ratio of two or three to one. In the case of a low carbon steel or softer material, this design could be modified even further by reducing the angle 25° and increasing the ratio to three to one, with durometer about 50.

Suppose for the moment the production rate is 500 or more units per day. In this case more than one grinding head would be indicated and the logical step would be to use one machine to do all stock removal operations with a very aggressive roll, and the second or additional machines for finishing operations with a finishing type roll.

CARE IN HANDLING

Once we have selected our contact roll design, its care becomes of the utmost importance. Proper contact roll care is important because each roll represents a very high investment, (b) expensive replacements can be avoided, (c) machine down-time losses due to roll change can be reduced (d) streaking of the work can be prevented (e) costly wrinkling of belts can be minimized, and (f) best grinding results are obtained from properly trued and ground rolls.

Provision must be made for proper handling of rolls in and out of the machine. This protects not only the rolls themselves, but the safety of the operators in handling such heavy rolls.

Although best grinding and polishing operations always result from a properly trued roll, care should be taken not to grind the contact roll too often because this needlessly wears the roll away and hastens replacement. The need for repeated dressing can be reduced considerably if operations are thoroughly planned. For example, where varying widths of material are to be ground or polished, the widest work should always be run first, followed by progressively narrower widths until the narrowest material has been done. As can be seen in Fig. 17, when any sheet material is run on an abrasive belt with pressure applied the contact roll tends to make the belt wrap slightly around the edges of the material. This behavior, of course, will vary with the hardness of the roll and the material. However, this condition does occur and as numerous sheets are run, it causes a gradual wearing away of the contact roll. Whenever possible, the contact roll should be dressed in the machine. This not only saves the time lost in removing the roll, but also trues the roll under its actual operating conditions.

When the roll must be removed from the machine for regrinding, care should be taken to grind it at its operating speed and if possible in its operating bearings. This is desirable because the softer rolls tend to "grow" at the higher; if the roll were ground under a higher than its usual operating speed, it would then be undersize and possibly misshapen for polishing operations. Likewise if the grinding is too low, the wheel will grow beyond this point when run at operating speed.

With rubber of 50 durometer or higher the roll should be recovered when the depth of grooves has been ground to less than 1/8 in. With contact rolls softer than 50 durometer, recovering should be considered when groove depth has increased to 3/16 in. Below this point the shallow depth will make the land action firmer than the roll was originally designed to exert.

• • •

Grinding the Lick Observatory Mirror

Grinding and finishing the main mirror of the 120″ telescope at the Lick Observatory is an outstanding example of stock removal and of precision polishing.

By CHRISTOPHER H. HILL, Sr.

● In the elaborate equipment for scanning the skies at the Lick Observatory, 4,200 feet above sea level on Mount Hamilton, California, the 120-inch mirror is the key piece of equipment. The removal of some 650 pounds of glass from the original four-plus ton slab, to produce a surface accurate to about two-millionths of an inch, is a classic story of painstaking precision in grinding.

Housing the mirror and the rest of the apparatus which makes up the telescope is a dome-shaped building 99 feet in diameter, whose 18-inch concrete walls rest on solid rock. The structure rises nearly 100 feet above ground level. The rotating dome, 96 feet in diameter, weighs 260 tons and rests on thirty two-wheeled trucks.

The open tube of the 120-inch telescope is 50 feet long and weighs about 40 tons with the mirror in position. In the photograph the mirror is covered to protect it from dust. The tube is essentially a mounting for the mirror, which with its supporting system weighs nearly ten tons, and which is attached to the lower end of the framework. The whole mechanism requires both the rigidity of a steel bridge and the precision of a fine watch. The telescope tube rests in a fork, which in turn is mounted on the end of a polar axle. These moving parts weigh 150 tons, yet they are floated on a film of oil under pressure to give ease of motion as the telescope follows the stars. The movement of the telescope may be controlled either from a fixed console on the floor or from one of the several observation stations.

With a concave face about two and one-half inches thick in the center and four inches thick at the edges, the mirror is optically very flexible, despite its 12-inch thick stiffening ribs. Of pyrex glass, the disc weighed 8390 pounds when it was cast by the Corning Glass Works of Corning, New York. After grinding, its weight was reduced to approximately 7740 pounds.

A power-driven cast iron lap was used for the rough grinding operation, together with a sludge of 80 grit silicon carbide and water. The glass disc revolved slowly on a turntable while the grinding tool passed over it in an elliptical motion to shape the parabolic face of the mirror.

After the roughing operation the finish was still further refined with the use of a sludge of F grade silicon carbide and water, in order to bring the surface of the glass disc down to a smoother finish.

After careful measuring, a sludge of 25 micron garnet and water was used in an intermediate finishing operation until the surface "fined" itself down to a finish that could be followed by the polishing operations.

For the polishing operations a very fine grade of optical iron oxide, commonly called optical rouge, was used, and the tool was coated with pitch. These final operations were done by hand. The optical rouge was smeared on the mirror and rubbed by hand with a pitch lap. Several types of pitch, both natural and synthetic, were used in the various polishing operations in order to get the best results.

During these final stages of polishing the mirror was mounted in its cell and was transferred repeatedly, a tedious and delicate operation, from the optical shop to the telescope by overhead crane and handling carriage, so that the critical testing could be done on the stars with the mirror in its operating position.

For testing with the mirror mounted in the telescope, a knife blade was inserted half-way into the light rays approximately ten inches before they reach the prime focus. This shut off half of the rays being reflected by the mirror to the prime focus, making half of the mirror's surface dark and leaving the remaining rays to be reflected by the mirror. Any errors in the light half of the mirror were reflected from the knife blade back to the mirror, making a light spot on it. At this point a photograph was taken of the mirror, from which the opticians could calculate exactly where the error was on the mirror and the approximate amount of glass which needed to be removed.

Main building, Lick Observatory, Mount Hamilton, California.

Over-all view of the 120" telescope at Lick Observatory. Note that the mirror at the bottom end of the open tube is covered to protect it from dust.

At this point great care had to be taken in order not to remove too much glass. It was a sort of "cut-and-try" proposition, for more glass could be removed, but if too much is taken off, it could not be replaced.

Knowing the relation of each photograph to the mirror, the opticians had little trouble in finding the exact spots where it was out of truth. For optimum performance the face of the mirror had to be accurate to at least two millionths of an inch. When the mirror was finished the face was a light gray, and there were no light spots on it from the knife test when it was viewed in the telescope.

The opticians work in a room that is held to a constant temperature of 72° F. They wear rubber-soled shoes while they are in the room, and white clothing that must be changed daily. The room is air conditioned and dustless, as great care must be taken to avoid even one minute scratch. • • •

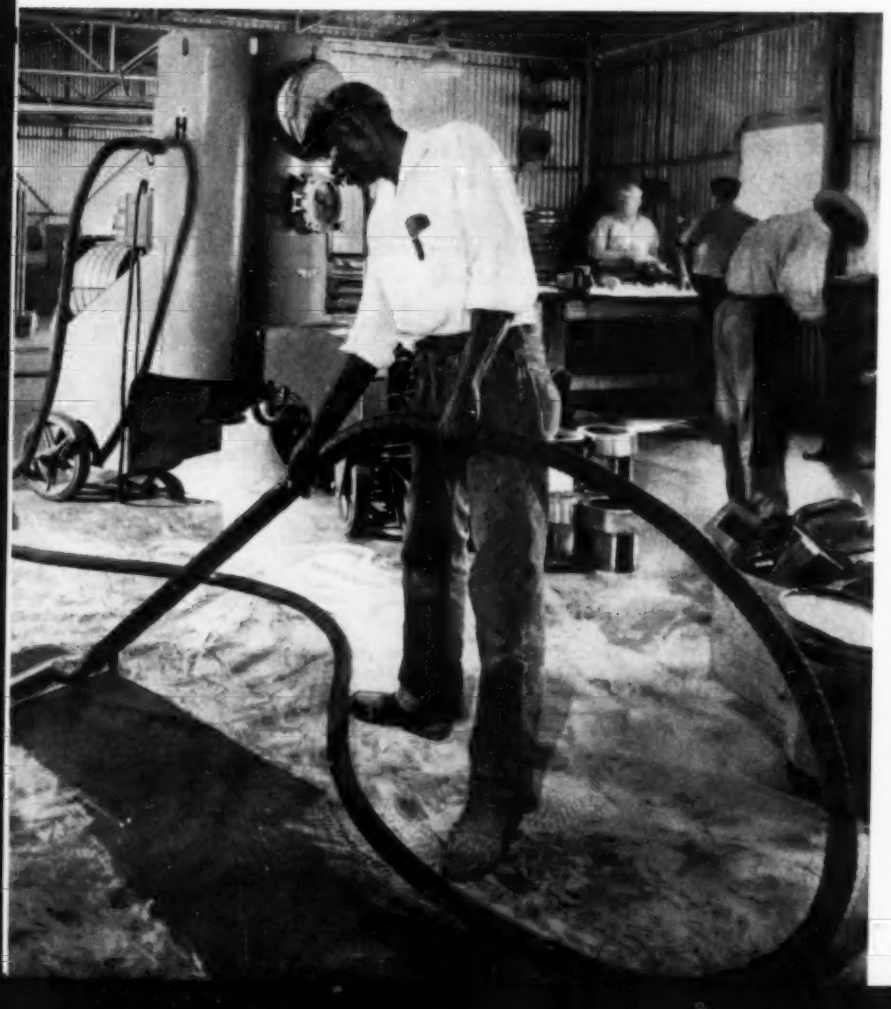
(The author wishes to acknowledge the help of Dr. A. E. Whitford, Director of the University of California's Lick Observatory, in the preparation of this article.)

Use of wet dust collector minimizes dust fire hazard in grinding magnesium, points way to wider application of light metal.

Portable Wet Vacuum Cleaner for Safer Magnesium Grinding

By LEWIS LIST, Manager, Air Appliance Division
and HAROLD KIRK, Research Director
U.S. Hoffman Machinery Corporation

Portable wet vacuum sweeper in operation. Unit sucks up dust from magnesium grinding, wets it down in 50 gallons of water, virtually eliminates dust fire hazard.



● Magnesium has many qualities that make it an ideal space-age metal. It is one of the lightest metals, with a specific gravity of 1.74. It can be readily ground and polished, or machined by other methods. It is easily forged and joined by welding. It can be cast by sand, die and permanent mold methods.

It has been widely used as an alloy of aluminum and zinc, as well as in structural members of a wide variety of equipment and in applications calling for protection against water corrosion—pipelines, water heater tanks and the like.

A major obstacle to the wide use of magnesium, however, is the fire hazard involved when it is in dust or chip form. In the solid state, magnesium will take temperatures up to and beyond 1200° F. Fine dust, however, ignites at temperatures below 900° F., while shavings under certain conditions will burn at temperatures of around 950° F. Temperatures developed during grinding are low but relatively high thermal conductivity can produce heating in conformance with its coefficient of thermal expansion, 0.0000145 in a temperature range of 70° to 212° F.

A significant factor is the growing use of magnesium in the development of wet vacuum systems which virtually eliminate fire and explosion hazards in fine finishing of the metal. Incorporating vacuum principles with modifications to include the use of water as a wetting agent, these systems help avoid dust accumulations and preclude the formation of

volatile hydrogen-air mixtures. They make magnesium a practical and economical metal for use where light weight is a consideration and costly machining might otherwise be necessary.

The need for proper safety precautions and the results obtained from use of a properly designed wet vacuum system for dust and chip collection is illustrated by the case history of Arlington, Texas Industries, Inc., producers of magnesium and aluminum castings for the aircraft industry.

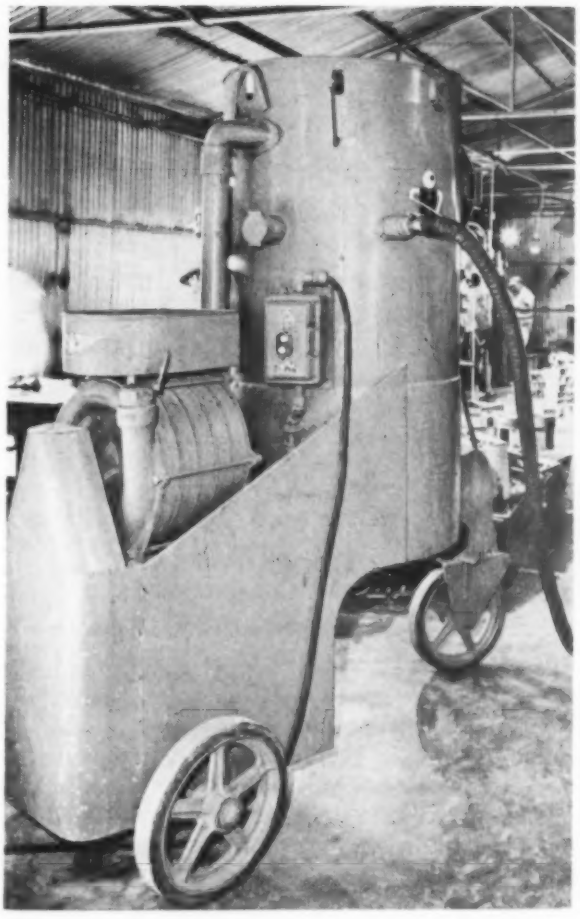
After a disastrous magnesium dust fire which spread the entire length of their building in less than thirty seconds and caused more than a $100,000 loss, the company purchased a 5 hp Wetcovac portable vacuum cleaner from the U. S. Hoffman Machinery Corp. This cleaner is used at machines where magnesium castings are ground to a smooth finish. It is at this point where the slightest spark will set off a chain reaction fire as one dust particle blazes to ignite the next.

Developing a suction of 6.5 HG, the Wetco-Vac has sufficient capacity to operate two 1½" ID cleaning lines simultaneously. All hoses are heavy duty, rubber covered and static proof. The cleaning tools and accessories are non-ferrous to minimize the possibility of sparking. Hoses can be 25, 50, 75 or 100 ft. in length. At the Arlington, Texas Industries plant, 75' of hose is used. As magnesium dust is picked up in the hose, a wet type dust separator with a capacity of 50 gallons of water wets and traps the material out of the air stream.

Air and entrained material pass between a series of internal baffles located above and below the water line. Mixing action insures thorough wetting of the collected material with the non-soluble portion settling to the bottom of the tank in the form of sludge. Periodic removal of sludge is essential and is made through a discharge valve. There are no internal moving parts and all interior surfaces are accessible for inspection and cleaning. For complete safety, the separator is equipped with a 16" gravity closing combination explosion release and inspection door, an 8" inspection door, and an 8" glass port hole door as well as two 2" gravity closing explosion vents.

The Wetco-Vac can be operated continuously for 8 to 10 hours before it becomes necessary to replenish the water supply. Inspection is made when the unit is not in operation to ascertain the correctness of the water level. Under proper supervision, the water concentration in the machine will always exceed the sludge to effectively eliminate the possibility of ignition. Sludge disposal is a matter of minutes with venting action precluding the formation of potentially dangerous hydrogen-air mixtures. The use of water as a precipitating medium keeps operating costs down and permits continuous wet vacuuming in virtually every part of the plant. Aside from its low cost and availability, water does not require filtering nor can it obstruct drainage.

The Wetco-Vac's dust separator, vacuum producer and motor are assembled into a compact streamlined unit mounted on roller bearing wheels so that the unit can be moved easily by one man. Motor, starting switch and electrical connections comply with NEMA standards for use where explosive dust is present. The electric cable is provided with a grounding wire for a positive grounding connection to provide additional safety.



Close-up of wet vacuum cleaner used at Arlington, Texas Industries.

The company now uses the Wetco-Vac constantly during working hours to make absolutely certain that magnesium dust does not accumulate in any spot in the building where it could conceivably be a fire hazard. Sludge is removed and buried daily for complete safety.

Prior to the purchase of the Wetco-Vac for the Arlington, Texas Industries plant, the constant job of guarding against explosions and fires from magnesium dust was a production handicap. The stopping and starting of machines reduced output and more men were required to handle each job. Arrival of the Wetco-Vac ended machine down time for cleanup. Production was increased substantially with considerable savings in labor costs.

With the development of efficient dust and chip collection systems such as the portable Wetco-Vac, it can be expected that present use as well as new applications for magnesium will be considerably increased. For by providing a relatively inexpensive tool for the elimination of explosion and fire hazards inherent in the finishing of light metals including titanium, beryllium and zirconium as well as magnesium, the Wetco-Vac insures good housekeeping and its resulting benefits—increased production and lower operating costs. • • •

CONTROLLED VIBRATION...
New Angle in Loose-Grain Finishing

Open-top vibrator speeds up loose-grain finishing operations by quicker loading and unloading, faster processing . . . requires less media and compound . . . permits inspection of parts during processing . . . eliminates pressure build up . . . uses less space.

By WILLIAM E. BRANDT
Vice President
Lord Chemical Corporation

● Harnessing mechanical sonic vibrations in new machine designs has created a radically different process for finishing metal parts with loose abrasives. For such operations as cleaning, descaling, deburring and fine finishing the new process has shown itself to be faster and more economical than similar methods while producing work of equal or better quality. In addition, it makes possible the finishing of shielded areas and interior surfaces that were formerly inaccessible for abrasive grain finishing.

Known as the Lorco Vibrator, the equipment, in contrast to tumbling barrels, has no rotating drum or compartments. Processing is accomplished in an open bowl or container which is not subject to pressure build-up and which is constantly accessible for inspection. The container can be loaded to within one and one-half to two inches of total capacity and every cubic inch of the entire load is kept in continuous work motion. With push-button control, the vibrator operates normally on a batch basis, but may be automated to fit the production requirements of individual installations.

The continuous motion of the vibrator is in contrast to even the most modern barrel finishing equipment, in which practically all the work is accomplished in the "slide" which constitutes only a fraction of the operating load.

The unique variable action of the vibrator causes an impressive rotary motion of the entire load as well as an even more important "scrubbing action" induced by the relative motion of the individual constituents of the load to each other. The efficiency of the process is due mainly to this action, which is also responsible for work in shielded areas and on interior surfaces. Depending on the choice of model, vibrators are supplied in fixed or infinitely variable speed ranges from zero to twenty-two hundred rpm which correspond to the frequency ranges employed. Amplitudes are fixed according to need.

The new vibratory process is not only very fast and efficient, but is also far more gentle on delicate work pieces where distortion must be avoided. In the vibrator, such pieces may be processed in capacity loads without any distortion.

The peculiar nature of the vibratory action in the frequency and amplitude ranges employed fully justified the original intent of harnessing mechanical sonic vibrations in a machine design which would bring about a new concept in cleaning, descaling, deburring, radiusing, fine finishing, coloring or burnishing any metal or metal alloy parts. One of the first models with a container of less than one-half a cubic foot proved capable of truly astonishing performance. It was found, for instance, that a husky burr on brass

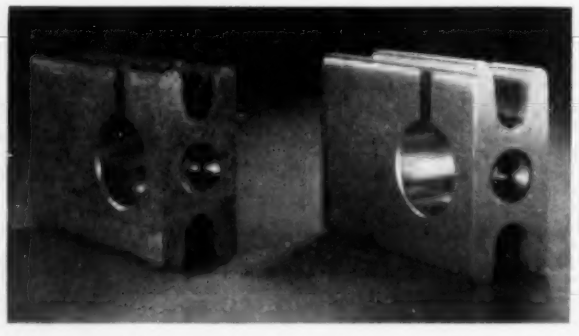


Figure 4. Before and after views of carbon steel automobile steering assembly parts which are deburred and finished in a continuous process vibrator at a rate of from 400 to 500 per hour.

Figure 5. Before and after views of machined cast steel parts which require external and internal deburring illustrate the effectiveness of the vibrator in shielded areas.

parts, which had previously required a four and one-half hour time cycle for removal, was taken off by the vibrator in fifteen minutes. Most exciting of all, the vibrator appeared to do a perfect job on shielded as well as on interior surfaces which were formerly inaccessible.

The latter discovery alone opened many new potentials, all of which were finally proven with much larger models in the laboratory as well as in field tests and under actual production conditions in various industries. Fittings and tubular parts requiring internal as well as exterior finish were vibrated with completely satisfactory results in production loads and in record time cycles. In many cases, one or more additional operations necessary when conventional methods were employed, could be omitted entirely, due to the fast and efficient action of the vibrator.

The complete range of applications for the vibrator has not yet been determined. It has been demonstrated, however, that cast, forged, machined and stamped parts are equally suitable for vibratory finishing. This new machine, in addition to doing work which cannot be done by barrel finishing, cleans, descales, deburrs, radiuses, fine-finishes, colors, and burnishes metal parts very much faster, better, and at lesser cost than by previous methods.

While, generally speaking, the Lorco Vibrator works from ten to one hundred times faster than a tumbling barrel, this time cycle advantage can even increase to a two-hundred-to-one ratio in the first thirty minutes in cases where cut-down rate is the sole consideration. When parts are processed with benefit of fixture, time cycles are usually reduced to one-half, if the fixture is supported on the frame of the machine or from without. When, however, the fixture is supported on the rim of the vibrating container, as is the usual procedure, the last mentioned time cycle is again reduced to one-half, since now there are, in effect, two separate vibrations. It is readily apparent that this phenomenon can be used to good advantage, especially in connection with the processing of very hard metals, such as especially hard stainless steel products, titanium, and other alloys.

The vibrator also excels in doing the common task very much faster, better, and at lower cost. A firm specializing in the manufacture of steel washers brought in some production loads for sample processing. Since the parts were being cleaned and deburred by self-tumbling, with just a portion of sawdust or ground corncob to absorb the oil and wipe the parts clean, it was correctly reasoned that they should be self-vibrated. Accordingly, one ton of parts were loaded with just a bag of ground corncob into the 20 H. P. Lorco Vibrator (12.7 cu. ft. capacity). The visitors were astonished to find that the ton of washers was finished in four minutes. In fact, they thought the pieces were slightly overdone!

It should not be inferred however, that the vibrator is to be viewed as a magic wand; if, for instance, an opening is too small to admit any effective media, then the interior of that opening cannot be satisfactorily processed.

As to media for vibratory finishing, the principles of selection are quite similar to those employed in barrel finishing. Then range of media for the vibrator is actually much wider. Of greatest advantage undoubtedly are manufactured abrasives such as fused aluminum oxide chips and bonded aluminum oxide and silicon carbide shapes. However, the entire range of steel shapes, ceramic media, pumice, and wood is also applicable. Some manufactured abrasives have been especially tailored for vibratory use as to crystal structure and bond, so as to be highly fracture resistant and long wearing.

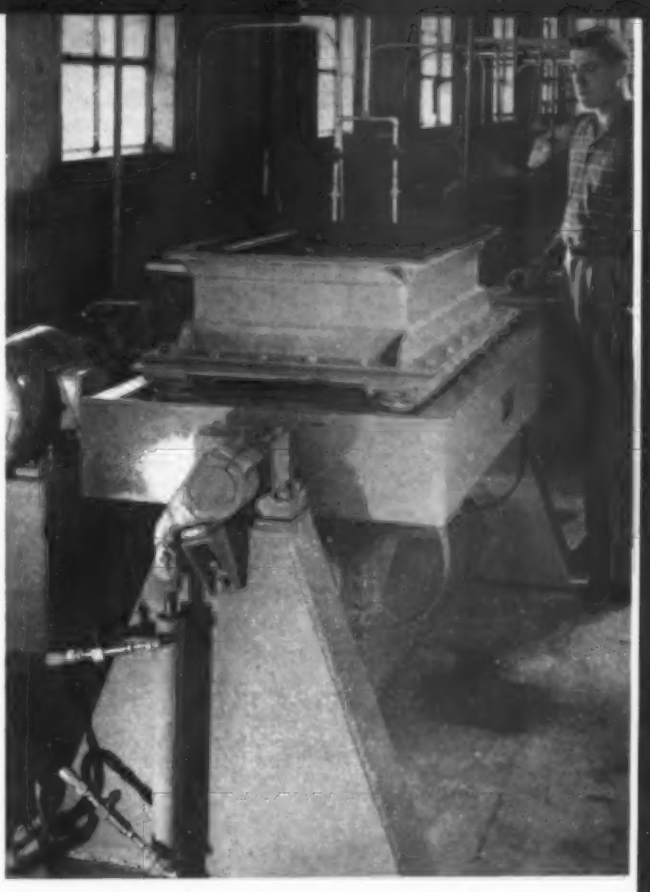


Figure 10. A left-end view of a 10 hp, 6.92 cu. ft. capacity vibrator loaded with glider buttons to be cut down and polished in fine aluminum oxide.

The use of compounds in the vibrator has been greatly simplified over the very considerable variety employed in barrel finishing. Only a very few basic compounds appear to answer every possible need. Two abrasive compounds, one for severe cut-down and one for finishing, are all that are needed for "cutting," deburring, or finishing. One coloring or burnishing compound is all that is necessary for all ferrous metals, aluminum and copper alloys. For ball burnishing a second compound may be used. Because of the rapid action in the vibrator, the abrasive compound mentioned can also be used for descaling purposes. A special descaling compound is, however, available for vibratory finishing of plastic items. The compounds are different from those employed with metals. Again, two or three compounds appear to suffice for such operations.

This is not meant to imply that the usual barrel finishing compounds will not work at all in the vibrator. Generally speaking, they will work only to a degree and may for that reason be uneconomical to use, while the specially designed compounds yield maximum results at lower cost. • • •

Effect of Filtration on Knife Blade Grinding

A cutlery plant reduces costs and increases quality through the use of coolant and filtration in place of water.

By HENRY W. FAZZANO
Assistant Plant Manager
Ulster Knife Company, Inc.

● The manufacture of fine cutlery, unlike much of Such intangibles are immeasurable, but in a cutlery factory we value these assets highly. • • • our automated manufacturing, is an art which depends on the skill of the operator. The Ulster Knife Co., Inc., of Ellenville, New York, has been manufacturing precision cutlery for 82 years. Their Schrade-Walden Cutlery Corporation Division's grinding of knife blades is a good example of the trades' use of skilled craftsmen and time honored processes.

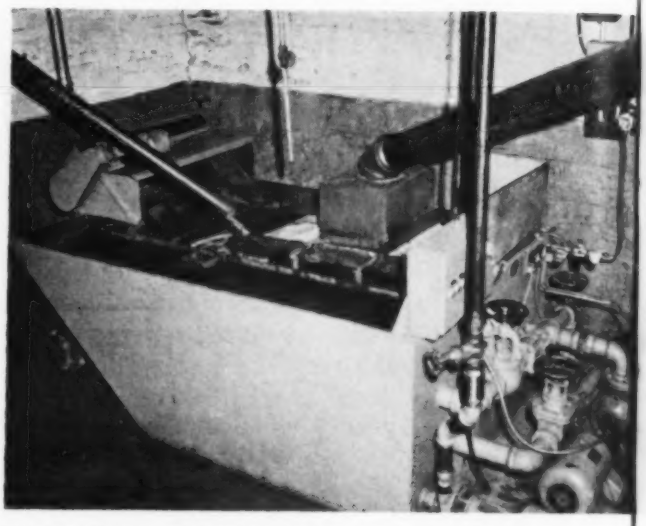
The famous Schrade-Walden pocket knife blades are ground on horizontal spindle machines which were using water as a coolant. This water was obtained by pumping directly to the machine from a fresh water creek. The water was, of course, always clean but presented problems of rust, wheel wear and sludge accumulation.

The division has now installed a closed coolant system and filter. The blades produced after the installation are far superior to any blades previously produced. The new method produces a near glazed finish on the first grind. Wheel life has been extended 20-25% increasing the productive time of the machines and reducing the costs of the wheels.

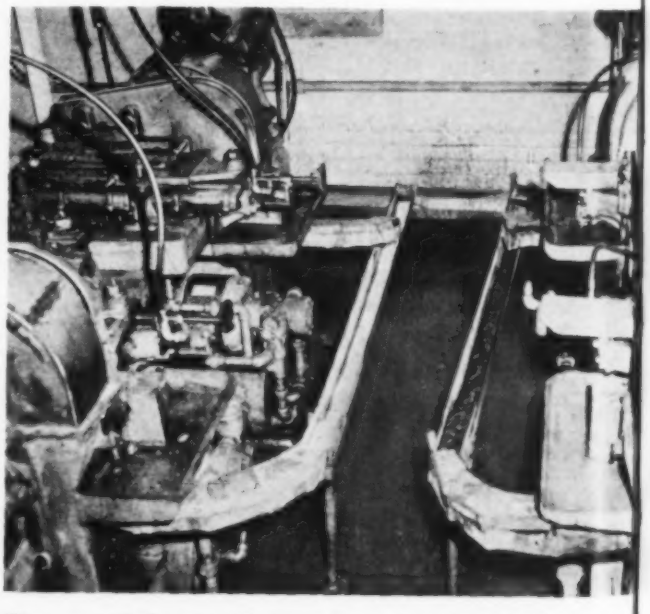
The machines built by Imperial Knife Co. Inc., Providence, R. I., using a hydraulic table with infinitely adjustable feed, are now maintained at much less cost, and rust has been virtually eliminated.

The filter, a Delpark Dual Manifold Vacuum Filter, manufactured by the Indiana Commercial Filters Corp. —Delpark Division, has reduced the maintenance for sludge removal from 8 to 10 hours to 2 hours or less a week. Sludge is now deposited in a tote box ready for transfer to a collection cart, whereas before, the pits in which the sludge collected had to be cleaned out every week.

By using troughs to carry the coolant to the filter, the grinding room remains much cleaner and dry. This in turn has greatly improved the working conditions, and presents a much more pleasant atmosphere.

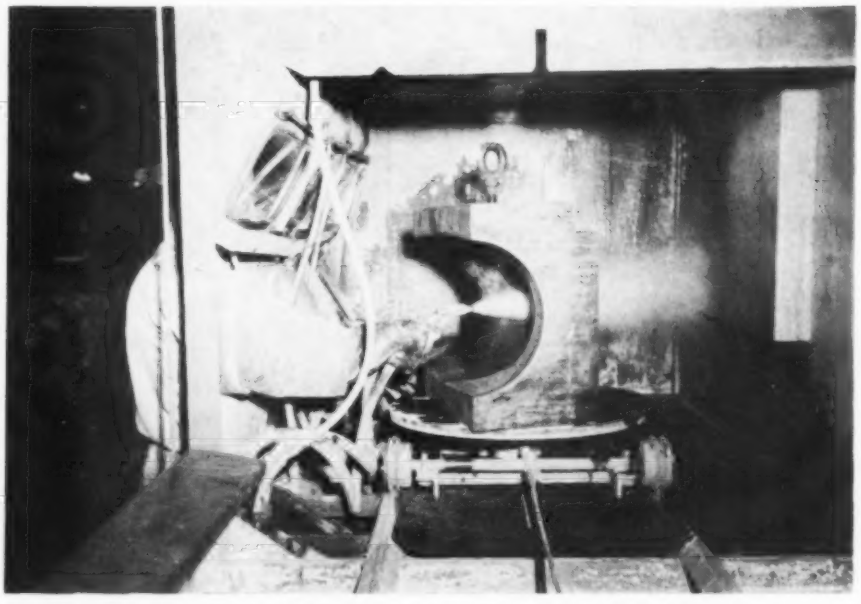


The Delpark Dual Manifold Vacuum Filter is shown here with the clean coolant storage tank as they are located in the Ulster Knife Co. plant.

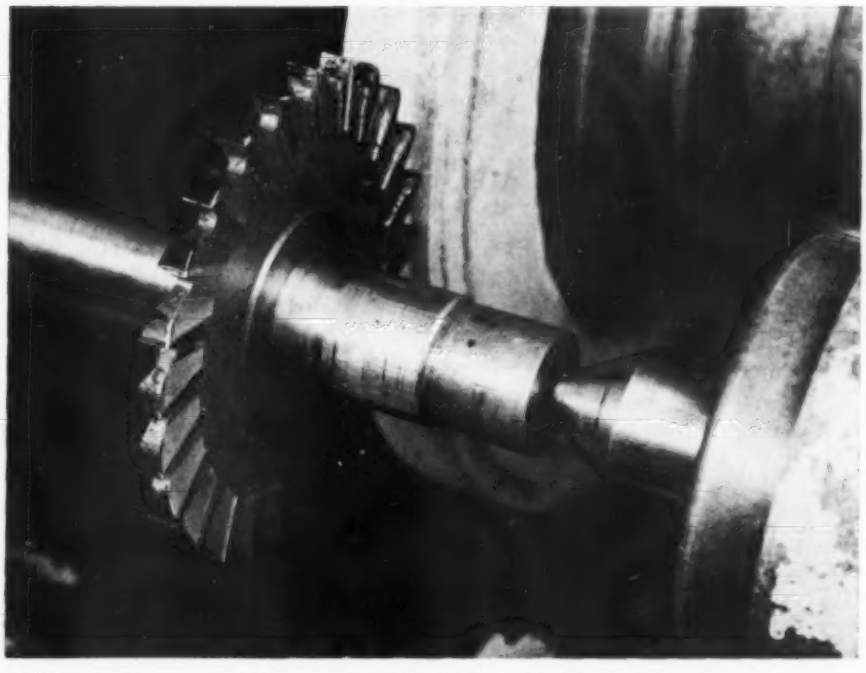


Close-up of the trough arrangement on two of the knife blade grinding machines at the Ulster Knife Co., Inc.

Ideas from the Shop



Wet blasting a 300-pound forming die. Blasting cuts cleaning and inspection time, lengthens die life.



Milling cutter mounted on a mandrel for cylindrical grinding of a narrow margin on the peripheral surfaces of the teeth.

WET BLASTING IN DIE MAINTENANCE

• The use of wet blasting equipment for the maintenance of forging and forming dies has resulted in four-fold savings for a prominent forging plant.

Inspection time is saved, as the dies are now cleaned before being inspected. A better job is done, too, than was the case when the dies were checked while they were still dirty.

Cleaning time is reduced. The 300-pound steel forming die is cleaned in 37 minutes by Liquamatte® wet blast, approximately a third of the time formerly required.

"PRE-DULLING" PREVENTS CHATTER ON MILLING CUTTER

By H. J. Gerber

• This may sound like the rankest sort of heresy but here is a method which effectively eliminates chatter from a milling cutter.

After normal grinding of the relief angles on a tool and cutter grinder we mount the cutter on a mandrel and cylindrically grind a narrow margin on the peripheral surfaces of the teeth. This unrelieved margin is very small —only two or three thousandths wide— or barely enough to detect with the naked eye. We coat the teeth with layout blue before grinding to enable the operator to check the width of this margin.

This idea has been used many times in our shop when chatter could not be eliminated by any of the conventional methods such as slowing down speeds, tightening arbor support bearings, tightening gibs, etc.

On the contrary, it appears to give longer life to the cutting edges and possibly this is due to the fact that cylindrical grinding corrects slight errors in radial distance of the peripheral cutting edges caused by wheel wear, etc. on the cutter grinder.

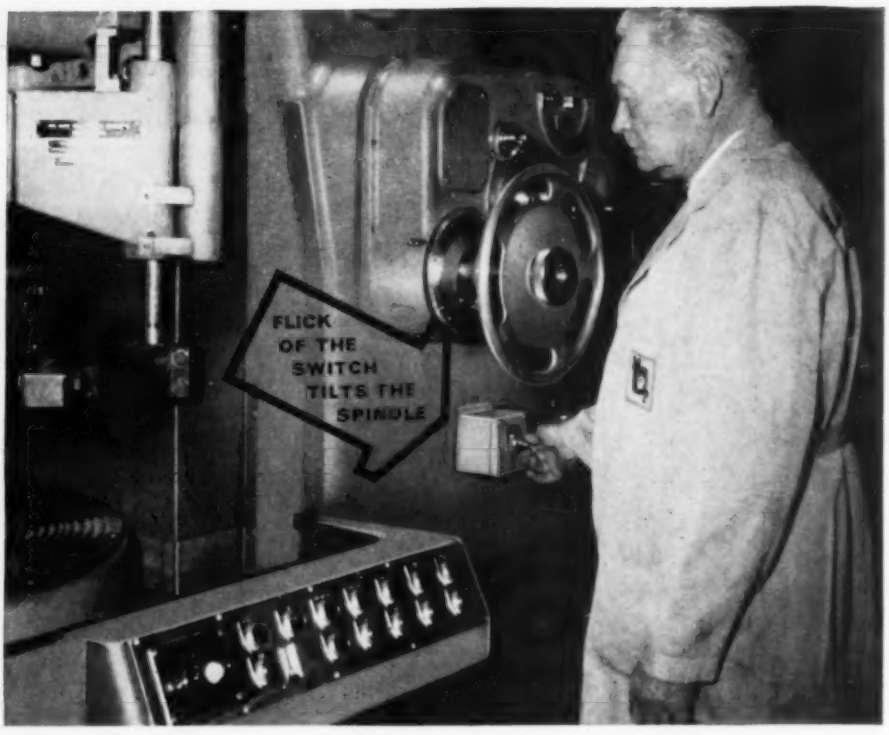
MATTISON
HIGH-POWERED
PRECISION
GRINDING
METHODS

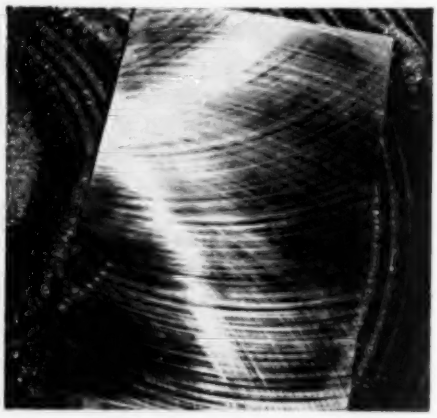
Quick-Tilt grinding—difference between a hogging cut and "going whole hog"

Mattison's No. 24 and 36 rotaries with Quick-Tilt spindle combine high stock removal and dead flat finish. New grinding method reduces direct and indirect costs simultaneously.

Now, you can rough and finish on one machine . . . in one setup, without costly downtime for resetting the spindle. On a Mattison rotary with Quick-Tilt spindle, you rough out the workpiece using the leading edge of the wheel, increasing grain penetration and stock removal. Then, a flick of the switch and you're set for finishing. A fast spark-out and every piecepart, under the center of the wheel or the outer edges, comes off with perfect cross-hatching that characterizes a dead flat surface (see illustration) and uniform dimensional accuracy.

This dual cycle means an increase in production of 50% or more. You can do more work better with a smaller inventory of wheels. What's even more important . . . you can reduce hidden costs because wheel-loading and heat-checking are eliminated. Downtime for changing and dressing wheels is minimized.





Behind Quick-Tilt . . . a machine that stays put

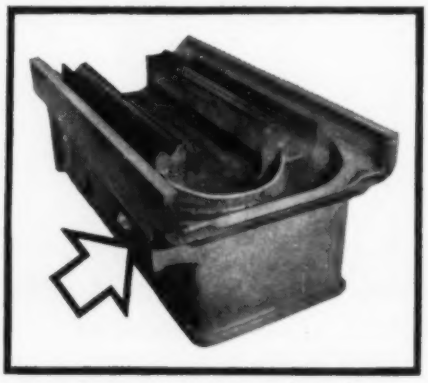
To give you savings like these, Mattison has combined the Quick-Tilt spindle and high horsepower (60 on the No. 24 and up to 100 on the 36), and backed them up with a heavy, rigid machine. Only on a Mattison do you get these four *big* advantages:

1. Massive full-length column—One-piece casting from the floor up eliminates deflection when pulling maximum horsepower. This means less stock to remove during spark-out.

2. Longer, wider, thicker ways—Prevent cocking or binding under fine feeds and heavy loads.

3. Close-coupled head—Only the spindle tilts, not the column. Patented 4-point suspension distributes the load.

4. Heavy double-walled bed—Rugged cross-rib and flange design, constructed from the finest Meehanite metal . . . stress-relieved by heat-treating.



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Bed design important

You can't get full production and accuracy from a high-powered surface grinder without something solid underneath to absorb heavy thrust from the table. That's why Mattison puts Meehanite in the base . . . not coolant. By keeping coolant in an outside tank, you avoid heat distortion and reduce downtime for cleaning. A 30-minute lunch break sees the job done.

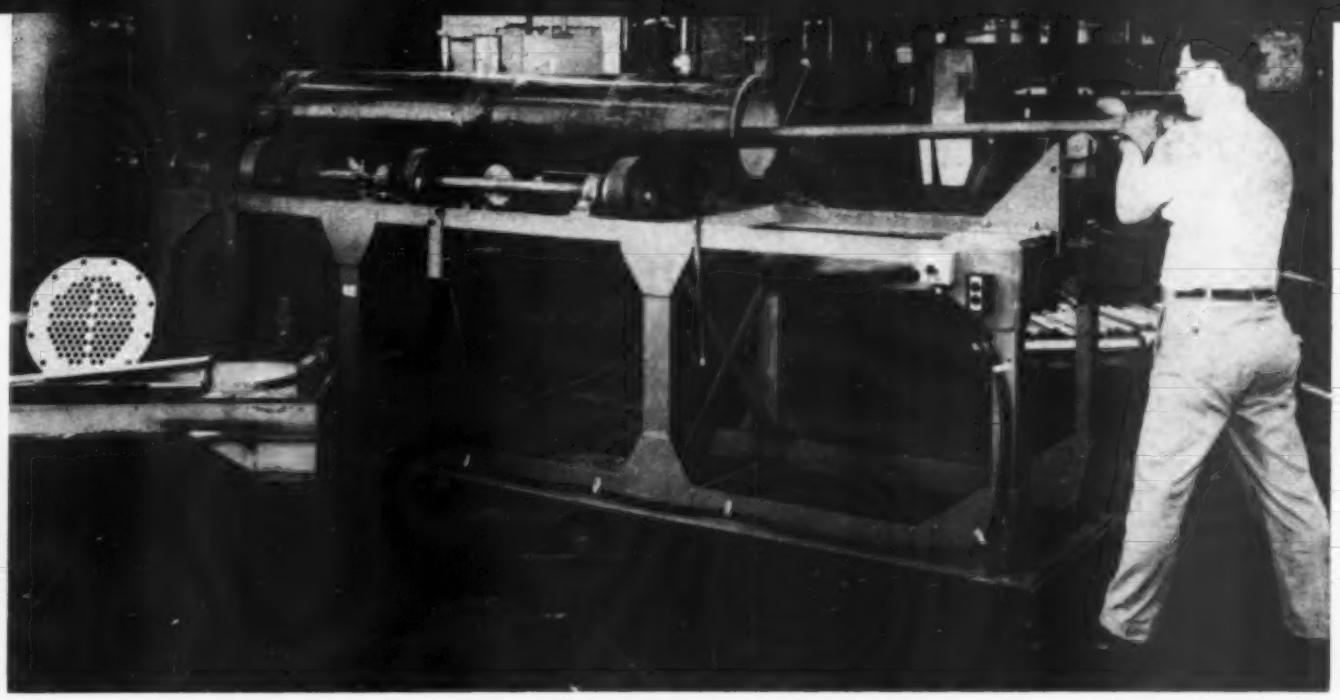
Try it and see

Let us show you the savings possible on your own pieceparts. Ask your Mattison dealer to arrange a test grind in our Methods Lab . . . or, if you would prefer, phone the factory direct.

MATTISON MACHINE WORKS
Rockford, Illinois Phone WOodland 2-5521

MATTISON MACHINE WORKS ROCKFORD ILL. U.S.A.

HIGH-POWERED PRECISION SURFACE GRINDERS



Six-foot table-room (upper left) for automatic blasting doubles as blast room for cleaning the inside surfaces of ten-foot condenser shells.

Dual-Purpose Blast Room Cuts Cleaning Costs

Portable positioning device and abrasive-tight door on blast room enable one operator to clean the inside of the shell in ten minutes.

● An integrated all-purpose Rotoblast cleaning installation has cut cleaning time by two-thirds and substantially reduced handling time at the Sturtevant Division of Westinghouse Electric Corporation, Hyde Park, Massachusetts, thus solving a unique cleaning problem.

The Sturtevant Division specializes in manufacturing large commercial fans and blowers and component parts for field assembled air conditioning apparatus. Shells and headers of large Freon condensers for air conditioning units must be thoroughly cleaned before assembly. The condenser shells are approximately 10 ft. long and vary in diameter from 12 in. up to 20 in.

Airblast is the only practicable way to blast the inside surface of the shells effectively. In the past this process was performed by transporting the shells to a distant blast cleaning station and accomplishing the job in a conventional airblast room.

Now a six-foot table-room, manufactured by the Pangborn Corp., Hagerstown, Md. serves the dual purpose of automatically Rotoblasting hot rolled headers, fan components and other parts in the process line, in addition to serving as a blast chamber for cleaning the inside surface of the condenser shells.

When used as a standard table room, castings are loaded through a single door which opens to expose half of the table. Cleaning of heavy mill scale is accomplished in a few minutes with premium quality chilled iron grit. An integral dust collection and abrasive handling reclamation system ventilates the compartment and cleans the abrasive for continuous reuse.

The table-room can be quickly converted to a blast chamber thanks to a smaller, special abrasive-tight door with a heavy rubber curtain which allows one end of the condenser to be inserted into the table-room. During the air blast operation the table-room is used to confine flying abrasive, provide necessary exhausting of dust and serve as an abrasive collection, separation and reclamation device.

The large condenser shells are loaded by chain hoist onto a portable positioning device which permits handling of bulky tubes by a single operator. After loading, one end of the shell is inserted in the table-room through the special side door. Compressed air lifts move two pairs of the small wheels up under the shell for easy roll-in. After positioning, the rolling wheels are retracted to allow the shell to rest on four pairs of larger wheels in such a manner that the shells can be continuously rotated during the air blast operation. Air blast is provided by a long lance nozzle which projects the abrasive at an angle of approximately 45 degrees.

Where it previously required 30 to 35 minutes of actual cleaning time in an airblast room it now takes about 10 minutes to clean the interior surface of an average size condenser shell. This dual-purpose installation has not only reduced material handling costs but increased the production time of a machine already necessary for cleaning operations. The airblast machine is a Pangborn AU-11 tank unit.

• • •

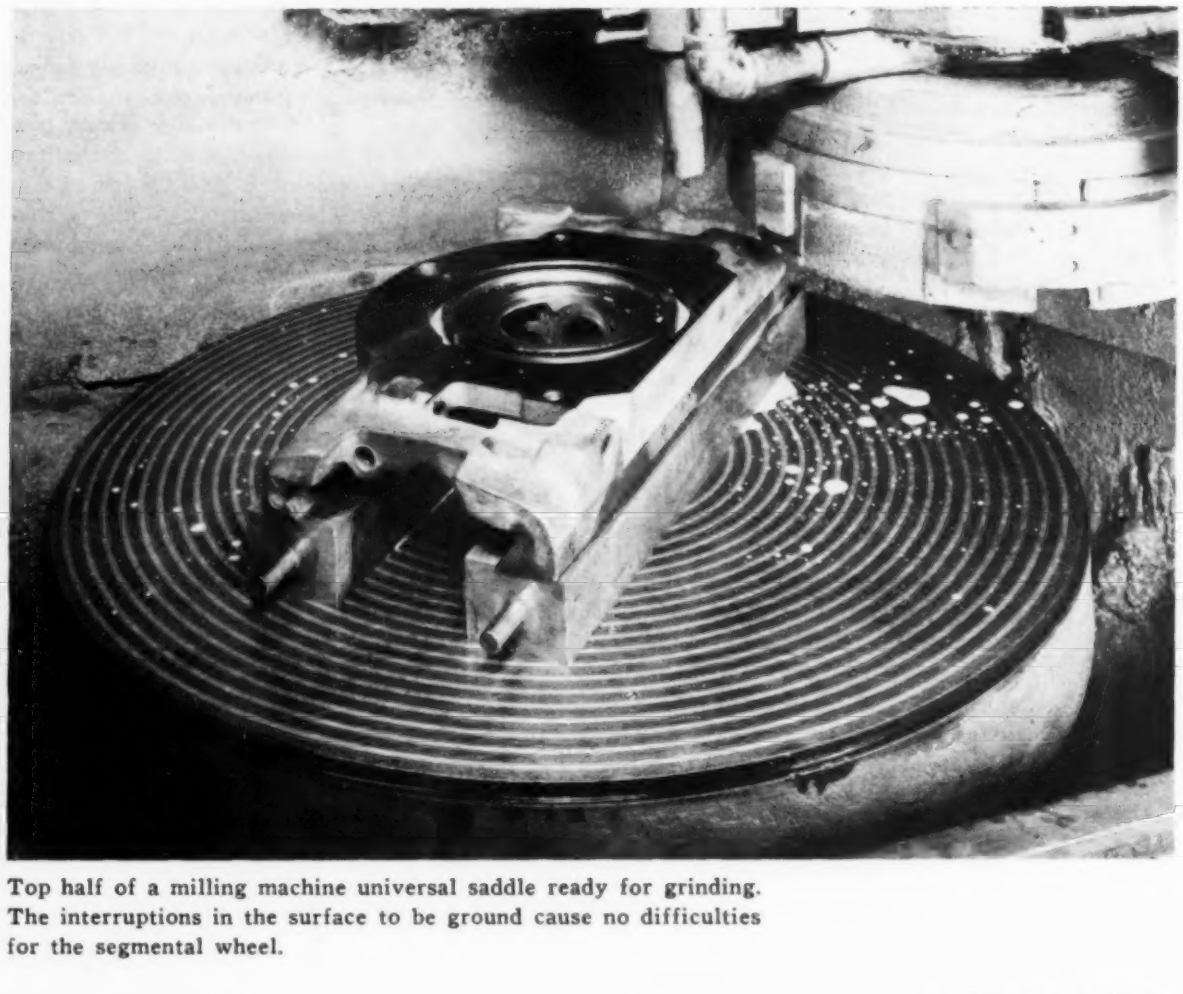
Design for Grinding

SCRAPING - Eleven Hours; SURFACE GRINDING - Fifty Minutes

● Scraping together the two halves of a cast iron milling machine saddle took eleven hours. Now the job is being done on a surface grinder in fifty minutes, twenty-five minutes per half.

To eliminate the scraping, each half of the saddle is now set up on parallels and ground on a Blanchard No. 18-36" chuck surface grinder. The picture shows the top half of a saddle set up for grinding.

Size is not important on this part, but the finish must be good and the ground surface must be flat with respect to the ways within .0003".



Top half of a milling machine universal saddle ready for grinding. The interruptions in the surface to be ground cause no difficulties for the segmental wheel.

Literature

1. Precision Instruments. 48-page Catalog No. 37M describes machinists' tools at work, with specifications and prices. Generally, representative precision instruments are photographed in some particular application. Instruments offered cover convertible micrometers, ranging from 0 to ½" by .001" up to 11" to 12" by .001" (also in sets), and various other micrometers, also test indicators and vernier tools. Innumerable gages include: depth, universal surface, and screw pitch gages. Brown & Sharpe Mfg. Co., Providence 1, R.I.

2. Diamond Tools are pictured in catalog in diagram form with sizes listed and machines for which they are recommended. Thread grinding tools, radius—contour and form tools, and contour—radius and form tools, are outlined with sizes included. The HD 700 dressing tool for heavy duty is described. Table for determining diamond tool size, and instructions on how to get the most out of diamond tools make it an instructive booklet. The Hayfred Co., 33 Lyman St., Springfield, Mass.

3. Portable, Magnetic Inspection Unit. Bulletin F-59 describes the Ferroflux method of locating defects in ferrous metal parts and assemblies, even through painted or plated surfaces. Hand-operated electro-magnet unit, and Detectascope, a complete cart-mounted inspection system, comprise the equipment. Ferro Machine & Tool Corp., 5514 W. Washington St., Indianapolis 41, Ind.

4. Saddle Control changes improve performance of the Taft-Peirce No. 1 precision surface grinder with removable ways. These changes are the replacement of the original flat saddle cross feed bearing strips with roller ways and anti-backlash cross feed screw and nut. Literature illustrates parts to be replaced, with numbers to specify, operating data, and installation notes. Taft-Peirce Mfg. Co., Woonsocket, R.I.

5. Double-Duty Wheels. Bay State's new Bayflex double-duty raised hub disc-wheel, as described in flyer, features two-layer construction enabling it to perform both grinding and finishing operations without changing wheels. When wheel is held at 30°-45° angle to the work, it grinds; at 10°-20° angle, it finishes. Bay State Abrasive Products Co., Westboro, Mass.

(See Number 1)

(See Number 2)

(See Number 3)

6. Deburring and Finishing Barrel, the Model DBM-10 portable Super Mite, is discussed in flyer. Specifications include 12" dia. x 8" wide barrel with ½ cu. ft. capacity; driven at speeds variable from 19 to 38 rpm by a 1/6 hp, 110 volt motor. Almco, Queen Products Div., King-Seeley Corp., Albert Lea, Minn.

7. Portable Grinders, Mounted Grinding Points, flexible shaft equipment, and stones for commutator grinding are among the 110 different maintenance, production and safety equipment products listed in Catalog No. 32. Dimensional drawings, how-to-use-it photographs and complete prices make the catalog a useful and ready-reference buying guide. Martindale Electric Co., 1312 Hird Ave., Cleveland 7, Ohio.

8. Skin Protection Creams which prevent dermatitis, called M-S-A Fend, are now available in three special-purpose formulas. Bulletin 0403-4 describes Fend A-2 which protects against water-insoluble irritants; Fend I-2 protects against water-soluble irritants, and Fend S-2 provides a barrier against diverse soluble and insoluble irritants. Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

9. Coated-Abrasive Machine, Polishing & Grinding Wheel. Folder describes the Model 1600 Barber-Colman deburring machine, manufactured by Barber-Colman Co., 1300 Rock St., Rockford, Ill., as offering a new process for high-speed gear deburring. It deburrs any size gear, sprocket, or toothed-wheel form up to 16" OD, with a diametral pitch from 3 to 32. The deburring tool is the PG wheel (polishing and grinding), made by the Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul 6, Minn., in diameters up to 14", face width 2".

10. Air-Operated Chucking Equipment is described in Bulletin PO-66D. In addition to illustrations and a complete listing of the line of standard Cushman air chucks and cylinders, space has been devoted to a typical application with detailed installation procedure. The Cushman Chuck Co., Hartford 2, Conn.

11. Finishing Processes. A 30-page catalog outlines the various types of finishing and abrading processes such as grinding, deburring, descaling, and polishing. Included are illustrations and detailed descriptions of the various conventional models as well as the Roto-Matic automatic finishing machine, and the newly developed Vibratron which employs a vibratory abrasive action. Roto-Finish Co., 3700 Milham Rd., Kalamazoo, Mich.

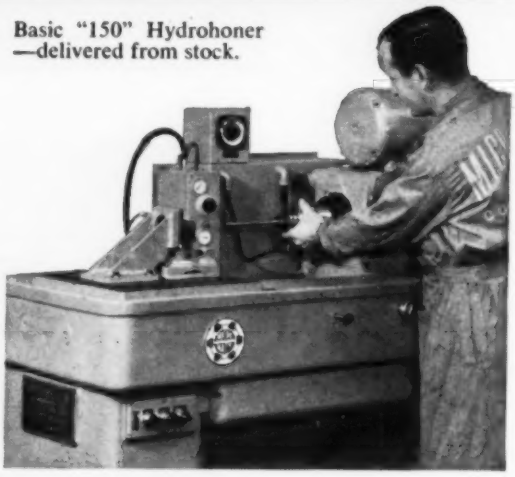
12. Cut-Off Wheels. One-page flyer describes these wheels for various materials such as aluminum, concrete, cast iron, copper, brass, porcelain, and steel. To obtain best results these wheels should be operated at 13,785 to 15,750 sfpm. Best results are offered when used on high speed machines equipped with proper hp motors. Tyrolit Co., 49 W. 37th St., New York 18, N.Y.

(See Number 9)

WHY "150" HYDROHONER

Reduces Costs . . .
Assures Controlled Finish . . .
Provides Rapid Stock Removal

To assure rapid stock removal and consistent generation of surface finish desired, the low-cost "150" Hydrohoner utilizes the distinctive Microhoning characteristic of self-dressing abrasives. Because abrasive grits are kept sharp-cutting at all times by a combination of controlled pressure and reciprocating-revolving motions of tool, a constantly high cutting efficiency is effected.



Basic "150" Hydrohoner —delivered from stock.

Microsize gage automatically ends cycle when exact size is reached.

Microdial automatic feed control and stone wear compensation.

Possessing a 12-inch stroke and a work diameter capacity of 1½ inches, the standardized "150" readily accommodates a variety of fixturing and tooling to assure easy adaption to a wide variety of work parts. Also, by addition of standard packaged units produced by Micromatic, it can be partially or fully automated.

Performing to the standards of higher-priced, special-purpose honing machines and incorporating features of a general-purpose design, the "150" Hydrohoner is an economical, long-range investment for long or short production runs.

Send Coupon for Complete Information.

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

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FREE LITERATURE *continued*

(See Number 11)

13. Heavy-Duty Centerless Grinder. "New Savings With Centerless Belt Grinding" is the title of bulletin offered on the Engelberg 8132-HD, reported to provide for extremely fine finishes, and close tolerances on any rod or tube stock. It is also said to precision grind and finish any length, taking diameters from 1" to 8". Featured are a new powered outboard support system and new automatic reverse feed. Engelberg, Inc., 831 W. Fayette St., Syracuse 4, N.Y.

14. Filter Elements. Four-page Catalog No. BFD-48, describing nine basic Bendix filter element materials for a wide variety of air, gas and liquid filtering requirements, is now available from Bendix Filter Div., Bendix Aviation Corp., 434 W. 12 Mile Rd., Madison Heights, Mich.

15. Diamond Wheels. Catalog offered simplifies ordering diamond wheels in every shape and size, resinoid, metal or vitrified bonded. The catalog will help the customer to select the right grit, wheel-shape and bond. Abrasives Div., Elgin National Watch Co., Elgin, Ill.

16. Engraving Machine Attachments and Accessories, covered in a 20-page catalog, include products such as cutter grinders, electro-markers, adjustable copy holder units, single copy slides, tracing styles, work holding devices, master index fixtures and cutters. H. P. Preis Engraving Machine Co., 223 Industrial Branch, U.S. Highway 22, Hillside, N.J.

17. Surface Grinder. The Thompson Type D hand feed surface grinder, as covered in descriptive literature, features steel

(See Number 16)

roller anti-friction slides which eliminate ball creep and increase rigidity; 14" standard vertical capacity under 7" wheel at no extra cost with no loss in vertical capacity when using wet attachment, and 5" table movement per turn of handwheel improves quality of finish and speeds up operations. The Thompson Grinder Co., 1534 W. Main St., Springfield, Ohio.

18. Abrasive Cloth. As discussed in booklet available, Metalite abrasive cloth is the answer to a heavy-duty grinding job or a case of real fine polishing. It is available in belts, discs, sheets and hundreds of special shapes and sizes to fit every production need. Behr-Manning Co., Div. of Norton Co., Troy, N.Y.

19. Weld Shavers. Two models, one which flush finishes stainless steel and other high strength alloys and one which flush finishes aluminum and other soft alloys, are described, with specifications, in folder. Finger-tip adjustment in increments of 0.0005" provides micro-stop depth control. Zephyr Manufacturing Co., Inc., 201 Hindry Ave., Inglewood, Calif.

20. Canvas Cushion Wheels are described with full specifications in four-page folder as not smudging or staining and being unaffected by oil, water, or grease. The wheels are ideally suited for use on factory trucks. Divine Brothers Co., 200 Seward Ave., Utica, N.Y.

21. Hydraulic Feed Surface Grinder. Literature discusses the No. 350 precision tool room type hydraulic feed surface grinder. Featured are powered vertical movement of wheel head (automatic downfeed available as optional feature); greased-for-life precision ball bearing spindle with two speeds for long wheel life, and infinite longitudinal table speeds from 5" to 120' per minute provided. Gallmeyer & Livingston Co., 416 Straight Ave., S.W., Grand Rapids, Mich.

22. Diamond Dressers. Crafts' diamond dressers for every need and use are covered in catalog available. Full prices, specifications and information about resetting on the manufacturer's line are included. Information also covers the Letter Series of tools. Arthur A. Crafts Co., Inc., 601 Newbury St., Boston 15, Mass.

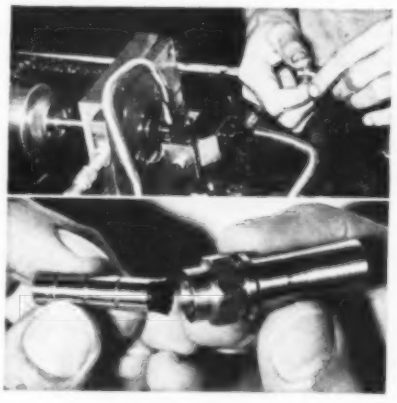
23. Small Hole Grinder, Rivett Model 84, is described in Catalog 84A as combining inherent accuracy with broad flexibility for diversified jobs. It mounts interchangeable wheelheads for internal and external spindles. Hole and external capacities reported are 3" diameters, maximum depth 4". Rivett Lathe & Grinder, Inc., 18 Riverside Rd., Brighton 35, Mass.

(See Number 20)

HOW Manufacturers Use "150" HYDROHONER To Reduce Costs...Control Finish... Obtain Rapid Stock Removal

Leading Manufacturers of precision parts are using the low-cost "150" Hydrohoner to secure high production, rapid stock removal, geometrical precision and controlled surface finishes. Indicative of the versatility for application of this highly efficient honing machine are the following recent installations:

The crankpin bore of a compressor connecting rod is Microhoned on a "150" Hydrohoner within tolerances of .00015" for taper, and .0002" for size and out-of-roundness. From .0008" to .001" of stock is removed from the bore (.875" diameter x .43" long) in about 8 seconds, while obtaining an 8 Microinch finish.



In this installation, a "150" is Microhoning in two runs the bore (.313" diameter x 1.375" long) of a braking cylinder. The first run removes between .004" and .006" of stock in 30 to 35 seconds. During finishing run, the final .0005" to .0008" is removed to provide geometric accuracy within .0002" tolerance and an 8 Microinch or better finish. Precision and controlled finish of bore prevent hydraulic oil leakage and minimize wear of neoprene-cupped piston.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE_____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

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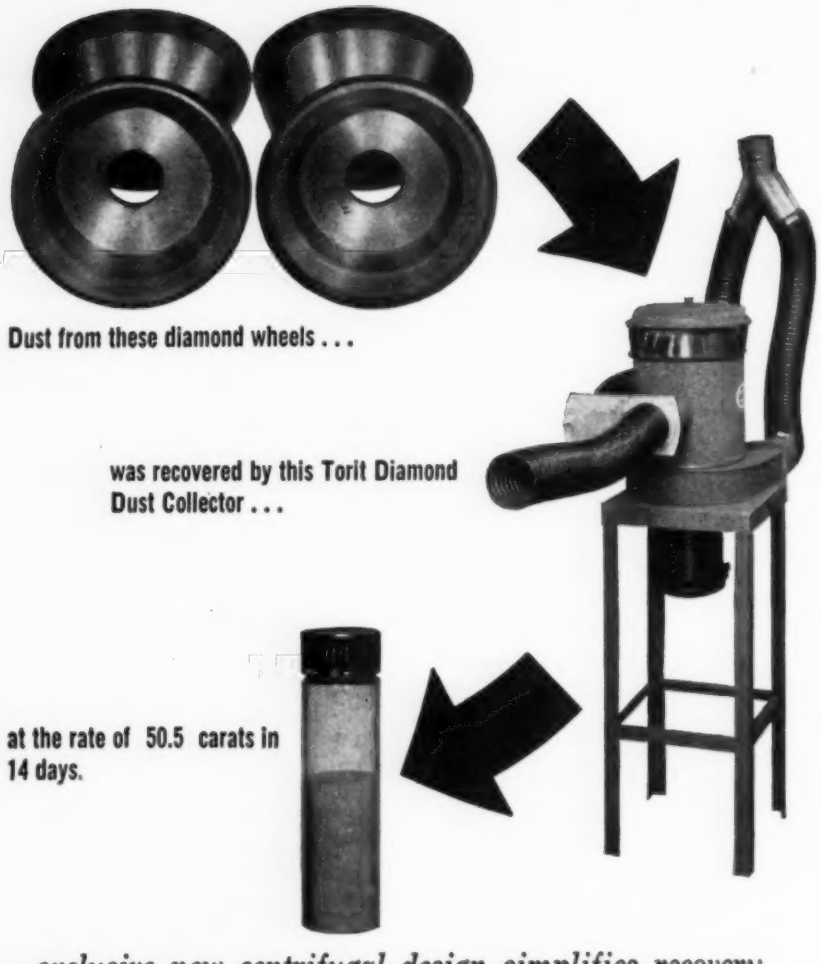
NEW TORIT DIAMOND DUST COLLECTOR SAVES YOU UP TO 30% OF CARAT USAGE; COSTS ONLY $178.50!



Dust from these diamond wheels . . .

was recovered by this Torit Diamond Dust Collector . . .

at the rate of 50.5 carats in 14 days.

exclusive new centrifugal design simplifies recovery, serves all diamond grinding operations

Actually pays for itself in days. In an on-the-job test of this new TORIT equipment, the initial investment was returned in just 21 operating days. The test was conducted by a leading automobile manufacturer under regular operating conditions. Recovery averaged 30% of the carats originally contained in the diamond grinding wheels. You actually get a cash return of $1.00 for every $10.00 invested in diamond grinding wheels.

For all diamond grinding operations. This new TORIT Collector provides the same outstanding performance in all types of grinding operations—mist, wick or dry. Its design and operational simplicity also mean virtually maintenance-free service. Its tough construction assures long, long life.

Installs anywhere. TORIT'S new Diamond Dust Collector can be used alone or in conjunction with central exhaust systems or unit dust collectors. It weighs only 65 lbs. and requires only 14" x 22" floor space. Its centrifugal separating action uses no filters or sloppy, inflammable oil baths. Service is quickly and conveniently performed by simply unscrewing the unit's top for removal and emptying of the clear plastic container.

FREE details and full specifications on request. Here's your chance to really save on your diamond usage. Write today for full information on this important new diamond grinding development. Dept. 1210

TORIT MANUFACTURING COMPANY Walnut & Exchange Sts., St. Paul, Minnesota

Use postpaid card. Circle No. 218

FREE LITERATURE *continued*

24. Air Filtering and Conditioning. 16-page Bulletin No. 518 illustrates and describes AAF's products for air filtering, cooling, heating, cleaning (controlling process dust), moving, exhausting, humidifying and dehumidifying air for the benefit of men, machines and profits. Included are descriptions of products manufactured by the Kennard, Herman Nelson, Illinois Engineering and American Air Divisions. American Air Filter Co., Inc., Dept. PD, 215 Central Ave., Louisville 8, Ky.

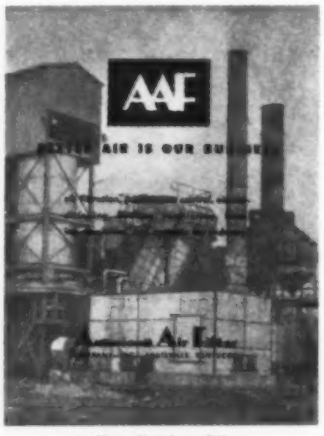
25. Saw Gumming Wheels. Form ESA-196 describes grinding wheels for saw gumming on both wood and metal cutting saws. Included is information on Simonds' new SA Borolon single crystal type, friable, aluminum oxide abrasive, vitrified bonded wheels, which are proving very successful on this class of work. Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

26. Drill Grinder. Sellers 10-G drill grinder, for grinding 1¾" to 5" diameter drills, is presented in folder offered by the Consolidated Machine Tool Div. The basic principle of these grinders is to grind one lip completely and then, with every condition the same, grind the next lip after rotating drill in chuck. Four sizes of grinders are available. Consolidated Machine Tool Div., Farrel-Birmingham Co., Inc., Rochester 10, N.Y.

27. Diamond Tools. Catalog CW58 covers details on diamond tools such as single-pointed diamond wheel dressers; cluster-type diamond wheel dressers; diamond-impregnated wheel dressers; thread grinding tools; special-shaped diamond tools for turning and boring; diamond tools for radius dressing and radius forming, and a selection of diamond wheels and hones. Clipper Diamond Tool Co., Inc., 345 Hudson St., New York 14, N.Y.

28. "The A B C's of Rust-Lick" is a 20-page booklet presenting basic information on rust, its causes, and application of preventives. Included is factual data on the various types of Rust-Lick rust preventing liquids and their recommended applications. Rust-Lick, Inc., 755 Boylston St., Boston 16, Mass.

29. Surface Grinder. Literature describes the Crystal Lake grinder as holding size as well as grinding round from .000005" to .000020", and finish is from one to four microinch surface finish. Crystal Lake Grinders, Crystal Lake, Ill.



(See Number 24)

30. Wire Brushes. Catalog offered contains detailed selection and operational data on the manufacturer's wire brushes. Anderson Corp., 1050 Southbridge St., Worcester 10, Mass.

31. Tumbling Barrels and Compounds. Data File offered consists of a heavy cardboard cover and 14 loose, single-page insert sheets each devoted to a particular type of barrel unit, tumbling medium or finishing process. Tumb-L-Matic, Inc., 10 St. Mary's St., Stamford, Conn.

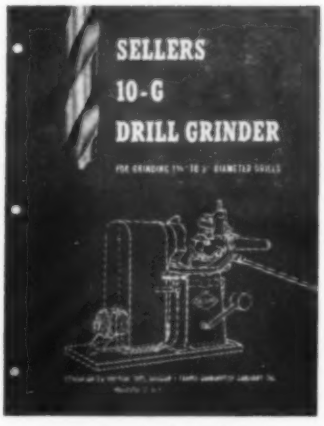
32. "A Guide to Grinding Wheel Selection" of vitrified and resinoid abrasive wheels and segments for snagging, surface grinding, cutting-off, tool and cutter grinding, and cylindrical applications is available. The Fuller Merriam Co., 70 Water St., West Haven 16, Conn.

33. Lapping Compounds. Catalog available describes the Spectrum pure diamond lapping compounds for precision lapping and fine micro finishing. Grit sizes are available for: 0 to 1 micro inch perfect mirror finishes on gauges, instrument parts, etc.; general purpose high polish minor finishing grades for final finishing of a wide variety of work. Penn Scientific Products Co., 1000 Old York Rd., Abington, Pa.

34. Solid Copper Diamond Tool. Turnable, the diamond tool with built-in turner, is described in detailed literature. A flick of the wrist and the diamond is turned. Shank and diamond sizes are provided for all grinders. Citco, Box 84, Chardon, Ohio.

35. Cutting Oils, in ten different types, are described in informative pamphlet. The complete line of Gulfcut oils, including mineral-lard oils, sulfurized-mineral oils, sulfurized-mineral-lard-oils, sulfochlorinated-lard oils and emulsifying oils are reviewed. The new Gulfcut heavy duty soluble oil is discussed in more detail. Gulf Oil Corp., Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

36. Jig Boring Machines, Measuring Equipment. Offering extensive specifications on each machine, a 15-page illustrated catalog lists the Hauser line of 13 types of jig boring and jig grinding machines, six types of pivot polishing machines and six types of optical checking and measuring apparatus. Attachments and accessories are also covered. Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, L.I., N.Y.



(See Number 26)

POSITIVE FILTRATION

(TO 1/2 MICRON) FOR AS LITTLE AS

.00015¢ PER GALLON!

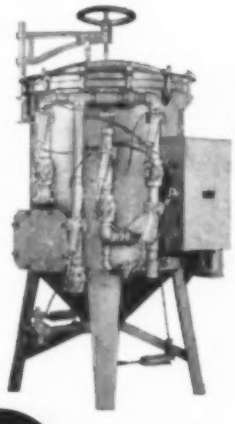
AND IT'S COMPLETELY AUTOMATIC!

Now, from Olson, a new dimension in industrial filtration — the first completely automatic, pressure-type filter! Every cycle — precoat, run, backwash—is automatically controlled. Injection of filter-aid (when used) and sludge carry-out are also automatic.

Maintenance is virtually eliminated in this trouble-free system. No parts to change, no elements to replace, and most important, *no costly downtime for cleaning!*

In large central systems, or with individual machines, Olson Filters guarantee over 96% purification of all types of coolants, cutting oils, quenching oils, cleaning and washing solutions and other industrial solvents at the lowest cost per gallon.

By the way, what are *your* costs per gallon? Why not check and see? Then call Olson.



The new Olson Industrial Filter is available in 8 standard models, from 10 gpm to 600 gpm capacities.

Write for free catalog on the new Olson automatic pressure-type filter.

OLSON FILTRATION ENGINEERS
Division of The American Laundry Machinery Company
DEPT G, CINCINNATI 12, OHIO

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FREE LITERATURE *continued*

37. Hand Tachometers. Five models are illustrated with descriptions, dimensions, and prices in folder available. A wide variety of accessories and speed ranges is offered to meet requirements. Unit detects overloading or need of repairs in motors or engines. Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.

38. Live Centers. Bulletin 1282 on the Vee-Arc live centers describes them as guaranteed accurate to .000020". They are designed for ultra-precision turning and grinding operations. Featured are: extended spindle, carbide tipped; lifetime lubricated, pre-loaded ABEC-7 ball bearings. Vee-Arc Corp., 50 Milk St., Westboro, Mass.

39. Dust Collectors. Descriptive literature reports the Dustkop as easily installed for efficient operation and simplified maintenance. 37 standard models to choose from. There are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Aget Manufacturing Co., 1408 E. Church St., Adrian, Mich.

40. Foundry Snagging Wheels. Peninsular's Snag-Master, as discussed in informative folder, is said to combine the advantages of faster grinding with longer life. Peninsular Grinding Wheel Division, 729 Meldrum Ave., Detroit 7, Mich.

41. Cylindrical and Centerless Grinding. An up-to-the-minute report filled with inside facts on outside grinding, by Norton specialists, describes "tricks of the trade" that get the most out of cylindrical and centerless grinders, provides on-the-job performance of different grinding wheels, and analyzes some highly efficient abrasives and bonds. Norton Co., General Offices, Worcester 6, Mass.

42. Abrasive Cutting Wheels. Bulletin DH-214 provides detailed information on abrasive cutting techniques, and the wide selection of Allison wheel specifications. Allison wheels are available 3" to 34" diameter, .006" to 3/16" thick. Allison-Campbell Division, American Chain & Cable Co., Inc., 926 Connecticut Ave., Bridgeport 2, Conn.

43. Metal Working Lubricants. Fiske's Fibrecool and other specialty lubricants and coolants are described in bulletins available. This new Fibrecool, a water-soluble cutting fluid, is transparent, cools while lubricating, and protects from rust. Fiske Brothers Refining Co., 129 Lockwood St., Newark 5, N.J.

44. Chipper Knives are featured in Vol. 2, No. 1 of "Cutting Trends." This two-page bulletin is issued periodically as a reference sheet on grinding wheels and machine knives for metalworking, wood, paper and allied industries. Simonds Worden White Co., 1101 Negley Place, Dayton, Ohio.

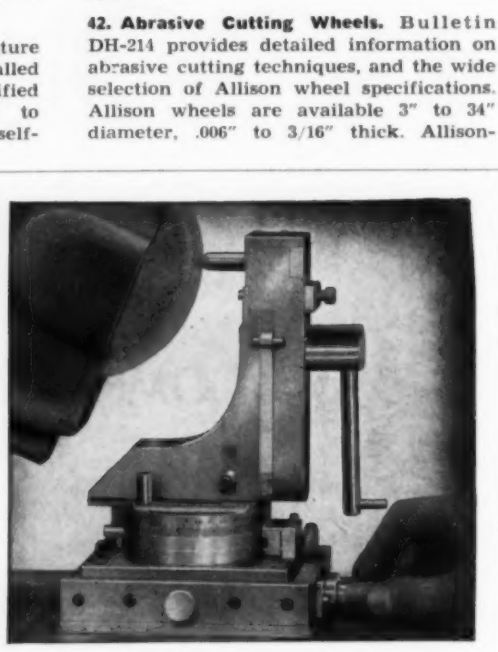
45. Disposable Media Filter. Technical literature describes the CFC Delpark disposable media filter as self-cleaning automatically, clarifying coolants continuously. The unit is also designed for cutting oils, quenching oils, and other liquids of light viscosity. Standard units have capacities of 2 to 700 gpm. Commercial Filters Corp., Melrose 76, Mass.

Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion
WHEEL DRESSERS
dress two angles tangent to a radius in one continuous motion



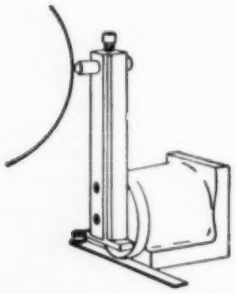
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

See your industrial distributor or write for free literature.

J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC. | 880 DORSA AVE. LIVINGSTON, NEW JERSEY

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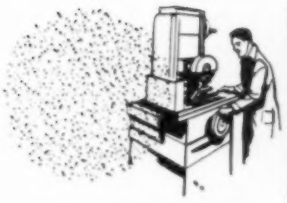
Book Review

"Standard'zation—What's In It for Me?"—this is the title of the printed proceedings of the Ninth National Conference on Standards, held in New York, November 18-20, 1958, just published by the American Standards Association, sponsor of the annual event.

In all, the addresses of 50 key figures are included in the 128-page illustrated publication. They are authorities from industry, government and science. Executives tell how they have put standards to work for profits in their operations—nuclear power, textiles, the chemical and petroleum industries, photography, in addition to machine tools. They explain why more standards are urgently needed to cut costs in purchasing, design and engineering.

The publication is available from the American Standards Assn., Dept. PR 60, 70 East 45th St., New York 17, N.Y. at $4.50 per copy.

"Grinder, eh!—Do you always remove metal this fast?"

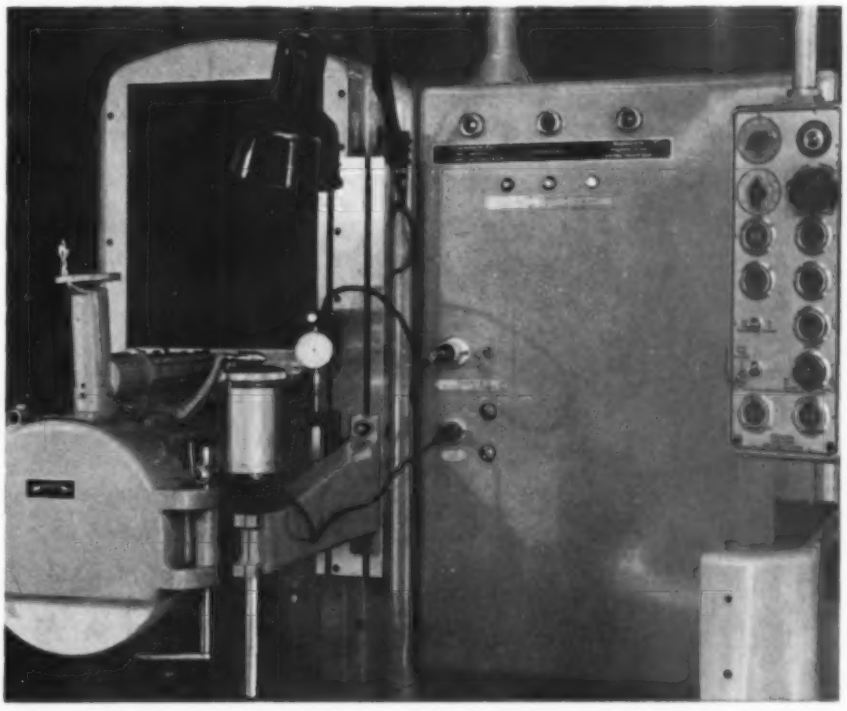


Equipment and Materials

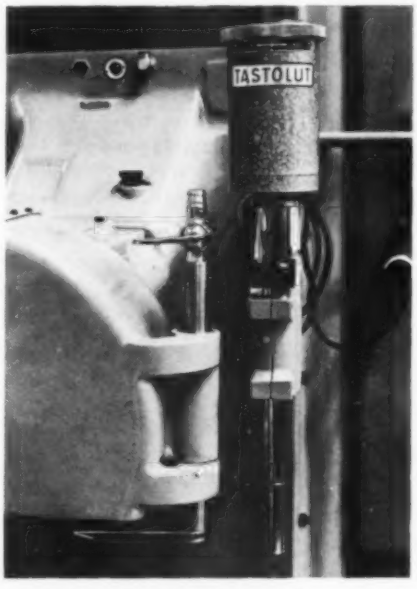
Attachment Provides Automatic Finish Grinding and Sizing

The Tastolute attachment Z 258, for wet or dry grinding, makes the finish grinding and sizing operation completely automatic when used with the Finimatic attachment on the Blohm surface grinder. This Tastolute attachment automatically compensates for wheel wear and uses a finished piece or a gage block to provide the reference dimension.

The positioning of the grinding wheel during the grinding operation is controlled by the Finimatic until the preset "O" position on the Finimatic is reached and the "red" light on the pendant control lights up. Further wheel movement is then taken over from the Finimatic by the Tastolute control. The downfeed of the spindle is then automatically determined at .000039" per reciprocation of the table for plunge grinding. This downfeed actuation takes place until the Tastolute sensing finger no longer finds a difference in dimension between the workpiece and the reference master or gage block. As soon as the finished sizing is reached, the Tastolute cuts out, and the wheel is automatically raised from the workpiece through the Finimatic control. The table movement also ceases at this time, after the wheel is removed from the work.



Blohm Surface Grinder HFS6, with Finimatic and Tastolute attachments which furnish automatic finish grinding and sizing operation.



Tastolute Feeler. When the amount of stock to be removed and desired finished size is pre-set, the Tastolute takes over for its part of the grinding cycle. The sensing feeler is lowered onto the master gage. Grinding then continues until the finished size in relation to the master is reached.

Automatic sizing with Tastolute attachment must be used in conjunction with the Blohm Finimatic.

The Tastolute consists of an electromagnet that pulls the follower with a metal ball downward as soon as the magnetic field is activated. As soon as the electricity is cut off, the follower is removed from the master by means of a spring. A relay installation controls the "pre-setting" and "work" sensing of the feeler.

The control panel has two switches and three control lights, having the following functions: (1) "on" and "off" switch of Tastolute, "yellow" control light (center); (2) switch for "pre-setting" and "work", and (3) "green" and "red" signal light for visual observation of Tastolute functioning.

In the operation of the Tastolute, it is turned on, and the "yellow" signal light goes on. Then the second switch is moved to "pre-setting" position. The rough setting of the follower is then accomplished by feeding the follower until it contacts the master workpiece or gage until the "green" light goes on. The adjustment knob is then turned in the "red" direction, until the "green"

light goes "off." The arc of this adjustment knob rotation is limited to 350°, in turn limiting the vertical travel of the follower to .002". After this is done, the switch is put on the "work" position.

Workpieces are now loaded onto the chuck and the amount of the stock to be removed is pre-set on the Finimatic, along with the desired finished size. When "O" is reached on the Finimatic depth control dial, the Tastolute sensing feeler is lowered onto the master gage at the first reciprocation of the cross movement (for conventional grinding) or on the first longitudinal reciprocation (for plunge grinding). The "red" and "green" lights signal varied stages as the grinding cycle continues until the ground pieces have the same size as the master workpiece or the gage.

Should normal Finimatic control "only" be desired, switching off the "yellow" light will cut out the Tastolute and the Finimatic will be operative as usual.

Hermes Machine Tool Co., Inc., 48-15 Northern Blvd., Long Island City 1, N.Y.

Use postpaid card. Circle No. 46

Burnishing Compound

Patclin No. 520 stainless steel burnishing compound incorporates the newest concepts of chelation, lubrication and a buffered pH, to develop high lustrous finishes. Work burnished in this compound is said to develop a higher luster faster, without scratching, darkening or developing any smuts.

The compound is shipped in a 425-lb. drum.

Patclin Chemical Co., Inc., 11-23 St. Casimir Ave., Yonkers, N. Y.

Use postpaid card. Circle No. 47

No Setting Masters Needed With Measuring Instrument

The Go-Devil Monitor can be used as a self-mastering comparator, measuring machine or dial indicator checker. Because it can be set to size in a matter of seconds and needs no setting masters, it is ideal for grinding and centerless grinding, the company states.

The instrument will check diameters,

lengths, heights, and shoulders. The $2\frac{3}{8}$" dia. serrated table accommodates parts of all shapes and sizes. In one setting, one piece can be checked, or thousands.

Accuracy to better than .00005" is claimed, with range of 0.000" to 1.500".

Instrument is furnished complete with wooden carrying case, adaptor for checking test indicators, and a .500" gage block.

"Go-Devil" Instrument Co., 624 Dutchess Tpk., Poughkeepsie, N.Y.

Use postpaid card. Circle No. 48

New Line of Extra Heavy-Duty Grinders

A new line of extra heavy-duty grinders (Nos. 637, 638, 640), designed for production work, is available in ½

hp, ¾ hp, and 1 hp. Cast iron tool rests are adjustable for height, angle and distance from wheel. Extended frame construction permits grinding large odd-shaped parts.

PRECISION GRINDING!

Or a combination of both . . . or specials for single purpose application

Constant speed motor delivers consistent spindle speed under any load within rated capacity. External and internal grinding heads are interchangeable . . . internal spindles reversible for either left or right precision grinding . . . direction of rotation changed to suit. Large, flat mounting pad (with ample bolt slots) adds to grinder's versatility . . . can be mounted to nearly any other production machine for a wide range of accurate work, large or small. For adaptation to special, single purpose applications, write for details. Successfully used for grinding both the common and unusual materials.

THE CINCINNATI ELECTRICAL TOOL CO.

314 MT. HOPE AVENUE • CINCINNATI 4, OHIO

Use postpaid card. Circle No. 221

Wheel guards are drilled for eye-shields and have exhaust outlets and spark shields. Full ball-bearing construction is lubricated for life. Grinders have capacitor start and induction-type motor. Standard equipment includes three fine and three coarse grinding wheels.

Also available is a heavy gauge welded steel construction pedestal (No. 626) designed for use with the above grinders.

Provision is made for floor and grinder mounting for the grinders mentioned.

Stanley Electric Tools, Division of The Stanley Works, New Britain, Conn.

Use postpaid card. Circle No. 49

Coolant Filters Are Automatically Self-Cleaning

A complete line of automatic pressure-type filters for cleaning of cutting oils, coolants, and lubricants comprises eight new models ranging in capacity from 600 to 10,000 gallons per hour. All are automatically self-cleaning.

These filters produce a continuous flow of clean filtrate, even during the periods when the filters are cleaning themselves. They rejuvenate themselves by backwashing, after which the filters are automatically precoated.

Because of small floorspace requirements—the 3,000 gal. per hour model occupies a floor space 3' square—the units can be mounted right at individual machines.

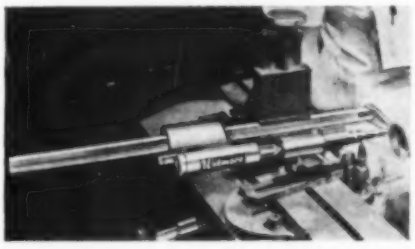
Olson Filtration Engineers, Div. of The American Laundry Machinery Co., 5024 Section Ave., Cincinnati 12, Ohio.

Use postpaid card. Circle No. 50

Center Holding Fixture Speeds Tool Grinding

The adjustable center holding fixture offers the accuracy of a dead center holding device and has a work capacity of 6" diameter and 16" length. Length adjustment is clamped against spring pressure to prevent end play during grinding. The fixture greatly simplifies sharpening and backing off of end grinding operations.

The unit speeds grinding and aids accuracy for grinding such tools as drills, reamers, counterbores, end mills, step tools and ID form tools.



Wetmore Tool & Engineering Co., 5320 E. Washington Blvd., Los Angeles, Calif.

Use postpaid card. Circle No. 51

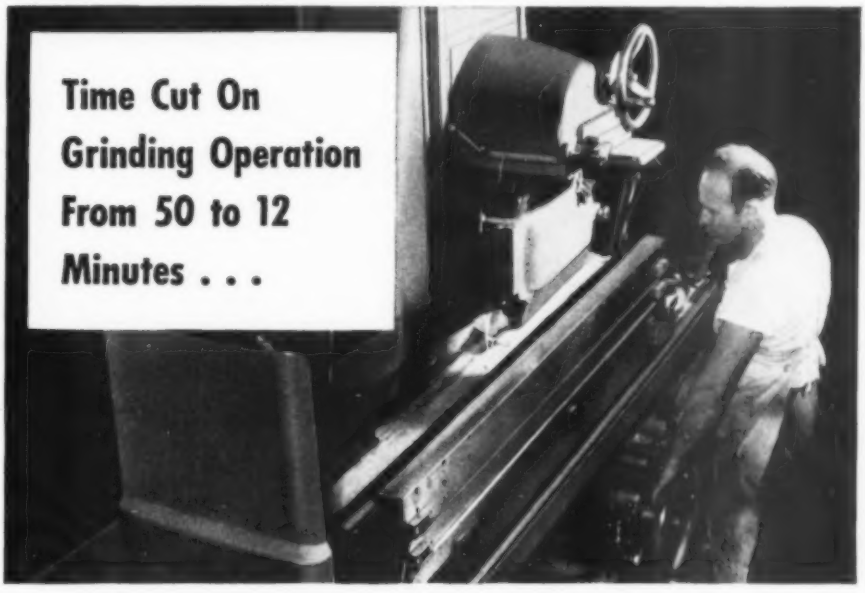
Soluble Grinding Compound Will Not Dry Out On Work

A dual purpose synthetic grinding and cutting compound, known as Kerns SGC-6560, is said to incorporate extreme pressure properties and leave an oil film on work. Excellent anti-weld qualities plus superior E.P. characteristics, that make it equally suitable for cutting operations, are reported.

The product completely eliminates rancidity and will not cause skin irritation, the company claims, and provides superior rust protection and lubrication. It will not dry out on parts, and will not cause binding or sticking, or impair operation of machines or machined parts.

L. E. Kerns Co., 2659 E. 95th St., Chicago 17, Ill.

Use postpaid card. Circle No. 52



With SUNDSTRAND "POWER-GRIP" Magnetic Chucks

Here's another good example of time savings with Sundstrand Magnetic Chucks. Two airplane flap tracks are held at one time for grinding on opposite faces of rail. Grinding stroke is 70 inches. Former time with conventional holding equipment was 50 minutes. With change to Sundstrand "Power-Grip" Chucks time is cut to 12 minutes . . . a savings of 38 minutes per part.

There's a good chance that you may be able to save considerable time in milling or grinding operations with Sundstrand "Power-Grip" Magnetic Chucks. Call in a Sundstrand Engineer. There is no obligation for this service.

Free Data is available on Sundstrand Clamping fixtures. Write today. Ask for bulletin 139-M.

SUNDSTRAND

POWER-GRIP

SUNDSTRAND-AMERICAN BROACH

DIVISION OF SUNDSTRAND CORPORATION

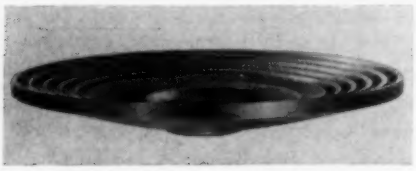
MAGNETIC DEPT. ANN ARBOR, MICH.

Use postpaid card. Circle No. 222

NEW EQUIPMENT *continued*

Dished-Depressed Center Wheel

A safer constructed, faster-cutting dished-depressed center grinding wheel is ruggedly reinforced with three full



layers of fiberglass permanently resin-bonded and molded to shape. An improved safety factor is made possible by the third full layer of fiberglass fabric, reinforced molded throughout the important bottom side.

The narrow face contact area of the wheel reduces excessive heat build-up, resulting in a cool cutting action and minimizing the possibility of heat cracks and breakage, even at its faster cutting speeds.

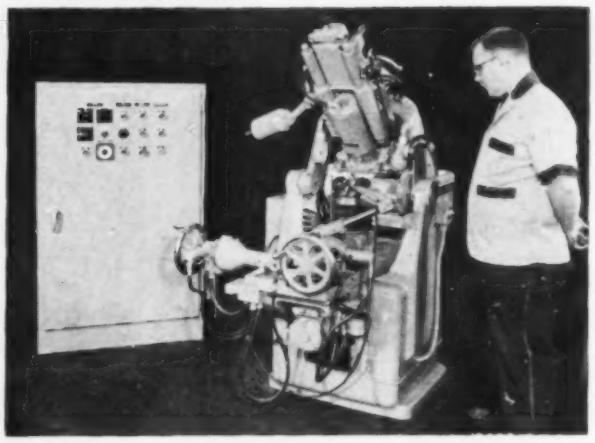
The wheels are offered in 7" and 9" stock sizes.

American Emery Wheel Works, Red Bridge, Providence, R.I.

Use postpaid card. Circle No. 53

New Cutter Grinder Is Semi-Automatic

As a companion to its recently announced automatic cutter grinder, The Ingersoll Milling Machine Co. is offering a semi-automatic cutter grinder which may be obtained either as a complete new unit, or by having power control parts added to manually actuated Ingersoll cutter grinders built in recent years.

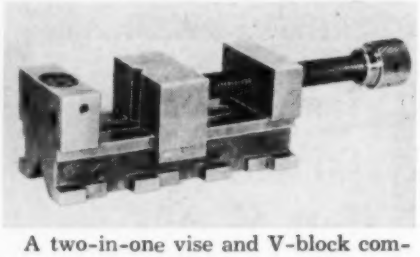


This semi-automatic grinder adds the advantages of power-controlled grinding to advantages already inherent in the design of the 30" Ingersoll general purpose grinder.

The Ingersoll Milling Machine Co., Rockford, Ill.

Use postpaid card. Circle No. 54

Vise & V-Block Combination



A two-in-one vise and V-block combination is reported to enable users to save money and time by planning work better, easier and with greater flexibility. The Vise-V-Block is made of finest hardened tool steel precision ground to .0004. Over-all measurements are 2"x2"x5"; jaw height, 1".

The unit may be used turned around, upside down, on all four sides or end.

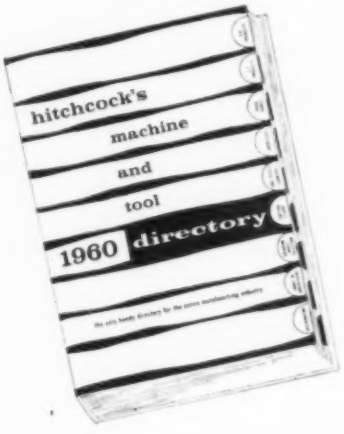
New Town Machine & Tool Co., Inc., 2401 Atlantic Ave., Brooklyn 33, N.Y.

Use postpaid card. Circle No. 55

NEW in the 1960 edition of Hitchcock's Machine and Tool Directory:

For the first time in any directory a special section on . . .

GRINDING WHEEL SELECTION



Your advertisement in this section . . . or elsewhere in the 1960 edition . . . will give you . . .

ASSURANCE that your product story will be in the hands of 30,000 key buying influences in the metalworking industry thruout 1960.

COMPLETE COVERAGE in the book . . . including cross reference to your advertisement in the Products Index and Manufacturers Address sections, listing of your products in the Advertisers Index and the listing of your distributors in the various Distributors sections.

INSURANCE that important people who may never be seen by your salesmen will have your product story—company and product identity insurance.

CONFIDENCE that your advertisement will go on working for many years, familiarizing persons who will some time be primary buying influences with your name and products.

A CHECKING copy of this valuable, hard-covered, sewn, "desk size" volume for your own use.

. . . so reserve space now !

WRITE FOR COMPLETE FOLDER NO. D-4 TELLING ALL ABOUT THIS DIRECTORY

HITCHCOCK'S MACHINE AND TOOL DIRECTORY • WHEATON, ILL.

Use postpaid card. Circle No. 223

Process Provides Discs With Max. Number of Cutting Edges

Coated abrasive discs are available for all metals, wood and ceramics, and are produced by Magnecoating. This process is magnetic orientation of the abrasive particles so that they are firmly embedded in the adhesive coating with the sharpest points upwards for the maximum number of exposed cutting edges. Excess loose particles are removed, leaving a clean, sharp cutting surface.

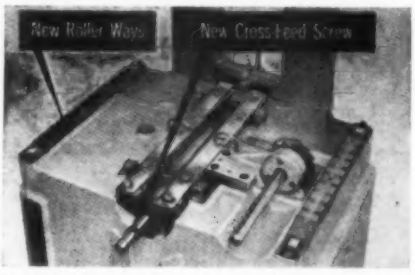
Discs are available in standard grits from 16 to 600 mesh for all normal grinding and finishing operations. For general industrial use on heavy metals, discs are provided in 16 through 100 mesh; for sheet metal work, from 24 through 180 mesh, etc. All discs are made in two sizes, 7" and 9⅛" diameter, with either ½" or ⅞" hole.

Abrasives Co. of America, 492 Main St., Ft. Lee, N.J.

Use postpaid card. Circle No. 56

Improved Performance With Saddle Control on Grinder

Important saddle control changes have been made to increase the versatility and tenth-splitting performance of the

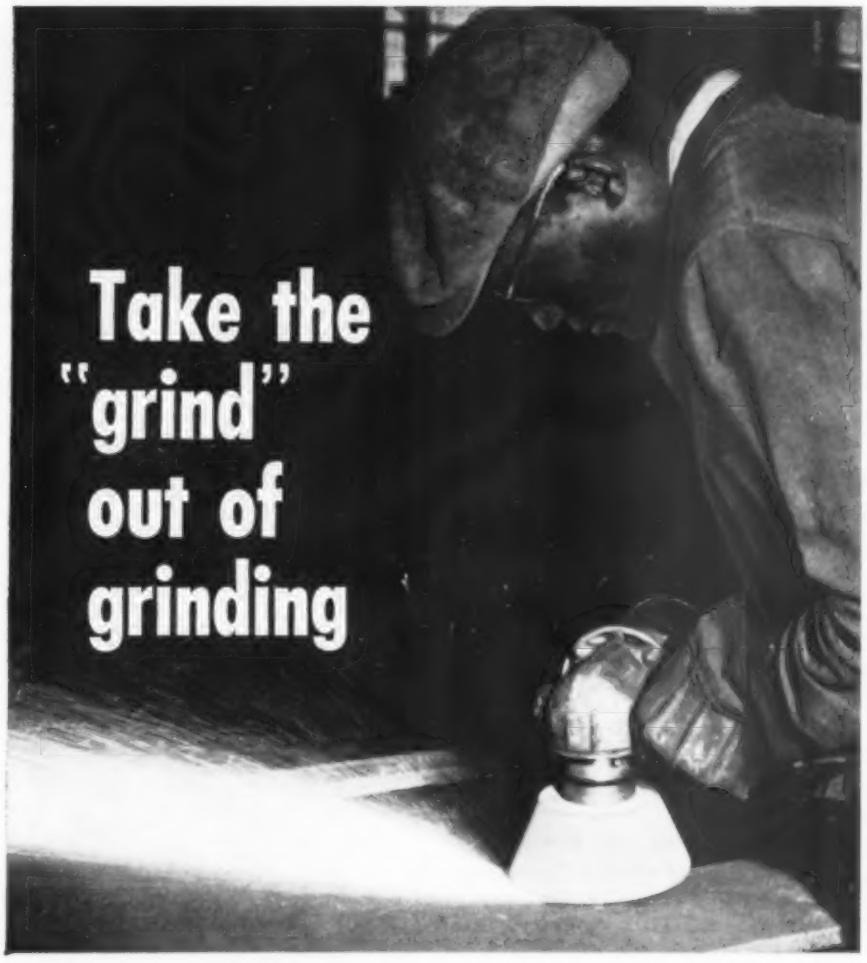


Taft-Peirce No. 1 precision surface grinder. Flat steel pedestal ways have been replaced by roller ways, a special anti-backlash crossfeed screw and nut assembly has been designed, and protective dustguards have been incorporated between table and saddle.

These changes enable the operator to sidewheel grind slots and shoulders without risk of saddle creep and without locking the saddle in position, it is claimed. Tests report that the saddle could be moved and returned to its original hand wheel setting with duplication well within .0001". The roller ways are said to overcome static friction and eliminate sliding friction for greater long-term accuracy.

Taft-Peirce Manufacturing Co., Woonsocket, R.I.

Use postpaid card. Circle No. 57



ATLANTIC WHEELS

Fast cutting and smooth floating action of Atlantic Grinding Wheels calls for less pressure and fewer passes . . . reduces worker fatigue and increases efficiency. Good reasons why you keep cutting costs down with Atlantic Wheels.

Atlantic Abrasive Corp.
A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

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CONES • PLUGS • MOUNTED WHEELS AND POINTS

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☐ Have Sales Engineer call without obligation.

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STREET .....
CITY ..... STATE .....

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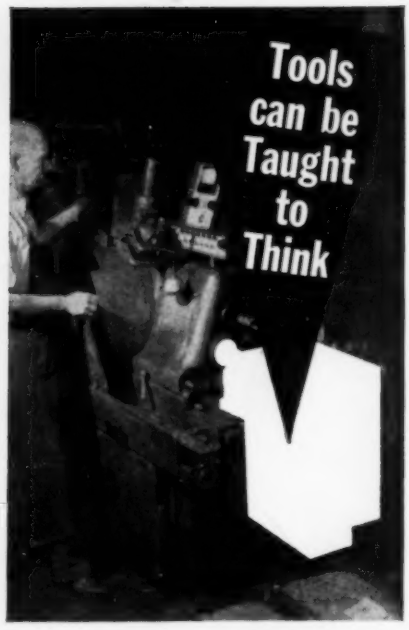

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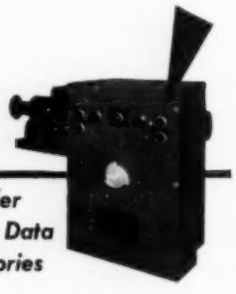
*at Our Expense**

The INCHWORM® motor, replacing the lead screw on centerless grinders, completely eliminates backlash and gives tolerances to ± .000025".

Standard *MICRO*trol® 160 gaging and control components can be added to the INCHWORM for fully automatic centerless grinder operation. These reliable, fully proven, closed loop systems have enabled many leading producers of precision parts to achieve previously impossible tolerances at lower production costs.



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HUNTINGTON STATION, L. I., N. Y.
A DIVISION OF CUTLER-HAMMER, INC.

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NEW EQUIPMENT *continued*

Lotion Protects Against Industrial Skin Rashes

Protective hand lotion Vanfaire, for the industrial worker with hands exposed to chemicals, oils, and paint, protects against resulting rashes. Protection lasts for 12 hours. It is soluble in soap.

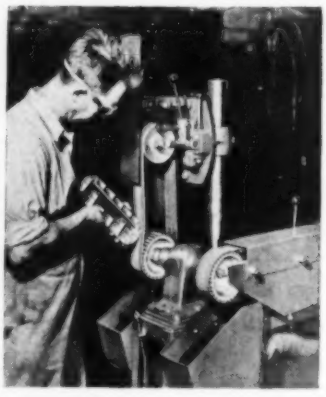
Lotion is available in 8 oz. plastic bottles, or by the gallon (with a wall dispenser).

Vanfaire Co., 10732 Riverside Dr., N. Hollywood, Calif.

Use postpaid card. Circle No. 58

New Line of 2½" Belt Grinders

A complete line of versatile 2½" belt grinders provides for fast, efficient grinding, buffing, and deburring. When



used instead of wheel grinders, the belt grinders eliminate the bother of set-up wheels and wheel dressing. Four standard setups are offered—single horizontal, double horizontal, horizontal and vertical, and double vertical.

A variety of accessories available includes: vertical support unit, safety guards, dust and chip chute, fully adjustable platen, dust collector and an adjustable tool rest for grinding. A 4" backstand idler unit is also available.

Standard equipment includes the arbor head, rubber contact wheel, 2-¾" backstand idler unit and an abrasive belt. Belt speed is 5400 fpm with 6" contact roll using standard 1725 motor.

Price, without motor and switch, for the single horizontal setup, is $129.50.

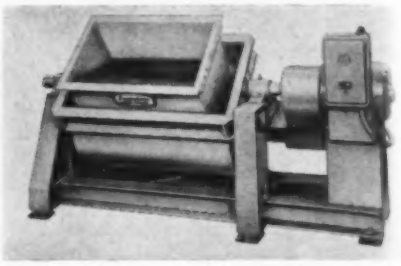
Rockwell Manufacturing Co., Walker-Turner Div., Dept. 1007, 400 N. Lexington Ave., Pittsburgh 8, Pa.

Use postpaid card. Circle No. 59

Vibratory Finishing Machine for Finishing Delicate Parts

Model VT-75 Vibrasheen, which vibrates the entire 5 cu. ft. load of parts and media, using a scrubbing action, is well suited for finer finishing of delicate parts and heavy burr removal.

Vibrating amplitude is adjustable to 7 settings from 1/64" to ¼" at a frequency of 1800 vpm. Magnetic reversing



starters have start and stop push-buttons, and there is an automatic cycle timer. Power is furnished by a 7½ hp, 1800 rpm, totally enclosed drive motor.

Optional automatic separating and overhead material handling system is also available.

Almco, Queen Products Div., King-Seeley Corp., Albert Lea, Minn.

Use postpaid card. Circle No. 60

Polishing Brushes for Use With Diamond Compounds

Hyprez polishing brushes, designed primarily for use with the rotary hand-

pieces of the Di-Profiler reciprocating hand machine, may also be used effectively with any type rotary hand tool.

These brushes provide for effective final finishing with diamond compounds. Three shapes—end, wheel, cup—are available.

Hyprez Div., Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Use postpaid card. Circle No. 61

Bag Type Dust Collector Recovers Gold Dust

This type AIR-4 bag type dust collector is larger than previous bag type dust collectors built by the manufacturer. It is particularly suited for re-

Grinding and Finishing

JULY, 1959

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Grinding and Finishing

JULY, 1959

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EQUIPMENT & LITERATURE ITEMS

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covery of gold, platinum or silver dust in the precious metals industry.

Powered by a heavy duty, drip-proof, 3 hp motor, the dust collector is designed for service with up to two 30" grinding wheels or two 18" buffing wheels. The dust collector has two 4" inlets with 6000 fpm velocity at each inlet.

A complete grinding or buffing installation with all necessary accessories can be furnished.

The Cincinnati Electrical Tool Co., 375 Mt. Hope Ave., Cincinnati 4, Ohio.

Use postpaid card. Circle No. 62

Portable Shaver Removes, Finishes Weld Beads

Removal and finishing of weld beads, which formerly required multiple grinding and sanding operations, may now be performed in one operation with the Weld Shaver. The tool uses a rotary cutter to remove excess filler and shave weld beads to surface plane. Finger-tip adjustment in increments of 0.0005" provides micro-stop depth control.

Model ZT508, recommended for use on stainless steel, steel and titanium welds, is geared to operate at 3,000 rpm. It is 11½" long, weighing 9½ lbs. Model ZT509, designed for use on aluminum, copper, brass and magnesium welds, operates at 8,200 rpm. It is 9½" long, weighing 7½ lbs.

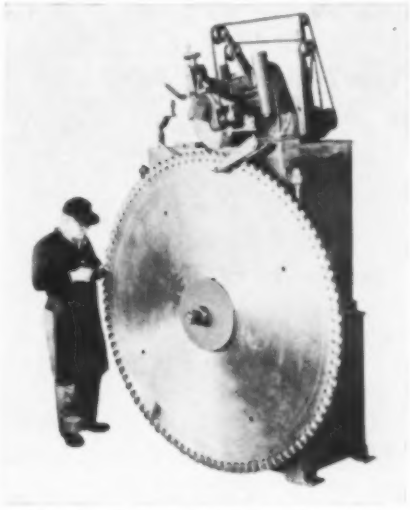
Zephyr Manufacturing Co., Inc., 201 Hindry Ave., Inglewood, Calif.

Use postpaid card. Circle No. 63

Heavy Duty Grinder Sharpens Metal Cutting Saws to 84" Dia.

The Hanchett No. 1184 heavy duty metal saw sharpening machine, featuring extremely heavy duty construction, with ball or roller bearings throughout, sharpens both hot or cold metal cutting saws up to 84" in dia. It has provision for automatically forming high and low teeth, and for alternately beveling the tops of the high saw teeth.

The mechanism is adjustable to a wide range of tooth spacings and depths of saw teeth. The length of stroke of the feeding mechanism and stroke of the grinding head are adjustable by means of handwheel controls. Grinding wheel



is 12" diameter, driven by a 1 hp electric motor.

Hanchett Manufacturing Co., 906 N. State St., Big Rapids, Mich.

Use postpaid card. Circle No. 64

Acidic Detergent Acts As Cleaner, Prepaint-Conditioner

Oakite Compound No. 86, a new acidic detergent, is reported to clean, remove smut, protect steel against corrosion and make steel more receptive to paint. It is also an effective cleaner for brass, aluminum, zinc, and terne plate.

Oakite Products, Inc., 157 Rector St., New York 6, N. Y.

Use postpaid card. Circle No. 65

Wheel Dresser Features Free-Spinning Wheel

The Spin-Kontrol wheel dresser features a free-spinning wheel, which is said to be particularly useful on diamond wheels because by its spin-controlled crushing effect it removes bonding material and exposes the diamonds

without tearing them from the wheel. Revolving instantly on contact, the dresser makes it easy for the operator to form a radius on a grinding wheel quickly and to dress a wheel to a sharp angle without breaking it down along the edge.

The dresser is furnished with three wheels—one each for dressing diamond wheels, coarse grit wheels, and fine grit wheels. The set also includes an Allen wrench and a drift pin.

Jarvis Corp., Middletown, Conn.

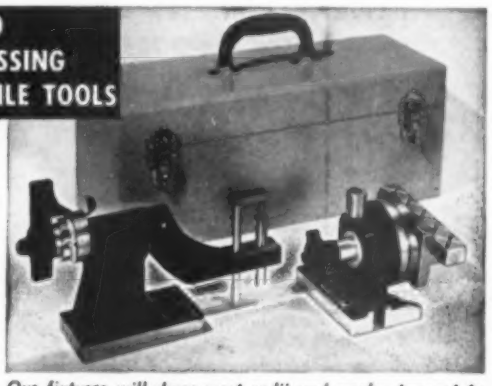
Use postpaid card. Circle No. 66

Now ANGLE-TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE BUT TOPS AT ONLY $149.50

(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box. Write for complete information.

PURCHASE EITHER TOOL SEPARATELY

Now you can purchase either the G-5 Radius Dresser or the G-2 Angle Dresser and Tool Holder separately if you so desire. (Without storage boxes)

G-5 Radius Dresser complete with diamond $80.00.

G-2 Angle Dresser and Tool Holder complete with diamond $87.50.

Replacement diamonds are always available for our units at a reduced price. Diamonds for the G-2 $5.00 each; diamonds for the G-5 $8.00 each.

Distributorship available in select territories

ROTHFUSS TOOL COMPANY

BOX 2696, ELMWOOD STATION PROVIDENCE 7, R. I.

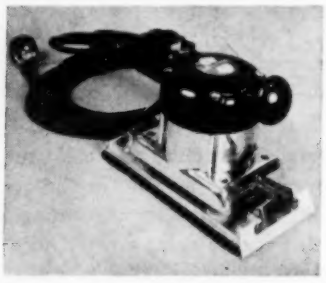
Use postpaid card. Circle No. 226

NEW EQUIPMENT *continued*

Less Operator Fatigue As Sander Almost Guides Itself

An orbital electric sander, the Model EO 900, features a single-phase motor which is said to insure constant operating speed without requiring belt or gears, and provides high starting torque, as well as being over-load proof. Only a slight pressure on the stock guides the unit, reducing operator fatigue.

One-half a standard sheet of sanding paper is used, so there is no need of special sanding paper sizes. Eight interchangeable pads are available for



sanding grooves, soft shaped surfaces, etc.

After 1000 hours of operation, the sander can be cleaned and lubricated simultaneously.

Sundstrand Machine Tool, Division of Sundstrand Corp., 2531—11th St., Rockford, Ill.

Use postpaid card. Circle No. 67

Two-Tone Safety Spectacles

Popular styling of the new two-tone Unibridge safety spectacles is combined with new modern design featuring one bridge which instantly fits more than 95% of employees. Time-consuming fitting is eliminated.

Welsh Manufacturing Co., 24 Magnolia St., Providence 9, R.I.

Use postpaid card. Circle No. 68

Clamp Assemblies With Safety Feature

A hold-down clamp has a telescoping action which allows one clamp to cover a wide range of work without using a large variety of T-bolt and stud lengths. A snap ring on the center bolt maintains full thread engagement for safety.

There are two sizes which handle most work.

Holmes Gage & Development Corp., 537 Bonham Ave., Columbus 3, Ohio.

Use postpaid card. Circle No. 69

Method Economically Produces Cams By Grinding

A money-saving method has been found for producing cams on the R-O universal form relieving fixture that, in turn, can be used on the fixture to cam grind production parts.

The easy production of precision ground cams in any number in a few minutes is typical of the various applications which have been found for the fixture. While primarily designed for relieving cutters with axial, radial or any combination form, this equipment has many uses in the shop.

A kit is being offered for converting fixtures to produce cams. It consists

of (1) a stationary follower mount to replace the pusher, (2) a short draw bar and nut for mounting the cam blank to give clearance for the grinder spindle, (3) a tining belt pulley is included for motorized fixtures of a ½" bushing for mounting the hand wheel on the shank of the master.

Royal Oak Tool & Machine Co., 29800 Stephenson Highway, Royal Oak, Mich.

Use postpaid card. Circle No. 70

PREFORMED TUMBLING MEDIA AND ABRASIVES

Does your present tumbling media plug the slots? Pick the proper size, shape and bond hardness required. At present we have six varying hardnesses of ceramic bonds. We vary sizing or coarseness of abrasive to meet the finish required. To meet present demands we now make over two hundred sizes, shapes and bonds. Tell us about your finishing problem.

We have distributors throughout the U. S. and Canada.

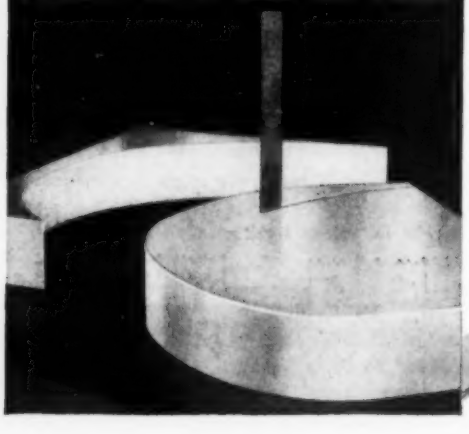
FORTUNE INDUSTRIES, INC.

11770 Dexter Road **Chelsea, Michigan**

Phone GReenwood 9-3621

Use postpaid card. Circle No. 227

Diamond Coated Band Saw Blades



For cut-off of reinforced plastics, ceramics, carbides and glass. Ideal for wafering of large diameter Germanium and Silicon Solar Discs.

NOW AVAILABLE — diamond saws especially designed for cut-off and machining of reinforced plastics. Precision cut-off wheels for semi-conductor production — made in Thicknesses down to .004"

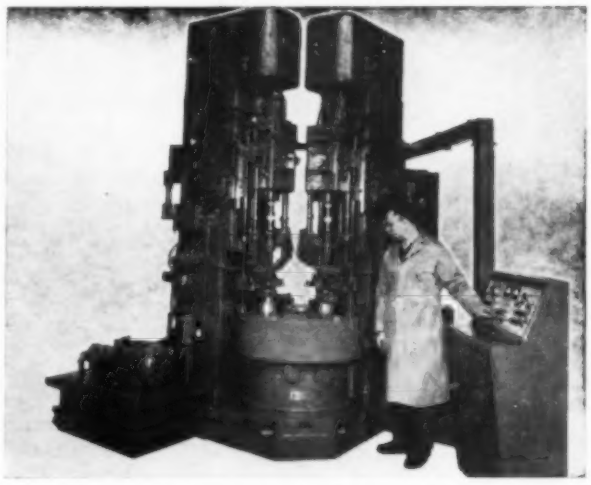
SAMPLE MARSHALL LABORATORIES, INC.

MANUFACTURERS OF QUALITY DIAMOND TOOLS

63 PARK AVENUE, LYNDHURST, N. J. WEbster 3-0570

Use postpaid card. Circle No. 228

Two Honing Units Operate Independently or Simultaneously



Motor rotors are said to be honed at the rate of 200 parts per hour on this BarnesdriL two-station production honing machine. The rotors are constructed of laminated steel and vary from 3" to 4" in length in different lots. Required bore size in all the parts remains constant at .8750 — .8755" with a surface finish of 25 rms.

Two complete standard BarnesdriL Model No. 223 vertical type honing machines are mounted on a common base with a two-station 180° rotary index table equipped with four fixtures. The two honing units operate independently or simultaneously as the job requires, meeting the need for producing specific quantities of different parts at the same time.

Both units are equipped with electronic hone expansion and Plugmatic automatic bore-to-bore sizing units. The hydraulically operated rotary index type table rotates 180° in each direction against positive stops for accurate positioning of the parts at each honing station. All machine functions are electrically interlocked for safety in operation.

Barnes Drill Co., 886 Chestnut St., Rockford, Ill.

Use postpaid card. Circle No. 72

Glass Tube Now Used for 3 Amplifications Instead of 1

The Multi-Amp tube for column type air gage instruments enables user to convert from one amplification to another —1250:1, 2500:1, and 5000:1–just by changing calibrated scales.

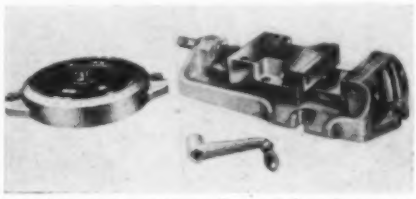
The new tube is reported to have a controlled variant rate of internal taper which permits greater clearances between tube and float and between gaging element and work.

Dearborn Gage Co., Air Gage Div., 32330 Ford Rd., Garden City, Mich.

Use postpaid card. Circle No. 73

Line of Trough Vises

A line of trough vises available is made of ductile iron, which is reported



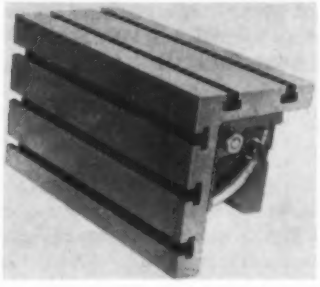
to give extra strength and hardness to resist cracking and to withstand heavy blows, and extra rigidity for extreme accuracy and holding power.

The vises feature a large trough for guiding the coolant to return without slopping over. A swivel base for setting the vise at any angle through 360° is optional. Jaw capacities are 4", 5", 6", 7" and 8".

The Skinner Chuck Co., Dept. D60, 105 Edgewood Ave., New Britain, Conn.

Use postpaid card. Circle No. 74

Heavy Duty Angle Plate



A large capacity heavy duty adjustable angle plate, called the Model 160, features two T-slotted plates—one plate, 8"x18", the other, 10"x18". The top plate is adjustable 0° to 45°; the side plate, 45° to 90°. The top plate has three 11/16" T-slots; the side plate, two 11/16" T-slots. The side quadrant is fully graduated for ease of setting.

The over-all height of the tool is 8¼".

Universal Vise and Tool Co., Parma, Mich.

Use postpaid card. Circle No. 75

CRAFTS

complete catalogue of DIAMOND DRESSERS for every need

Now ready for you—CRAFTS catalogue of diamond dressers for every need and use. Full prices, specifications and information about re-setting on the famous CRAFTS line. Information too about our inexpensive "Letter Series" of tools. CRAFTS continuous research and job testing provide you with more economical ways to increased production. Always dependable, CRAFTS service reduces costly delays — minimizes downtime.

Mail this coupon for your free Diamond Dresser catalog.

ARTHUR A. CRAFTS Company, Inc.

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FEEDCISION

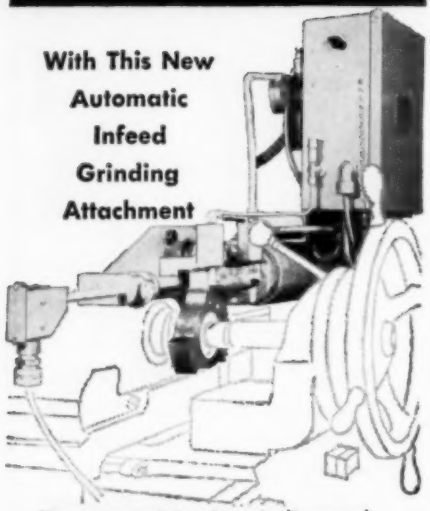
INCREASES CENTERLESS GRINDING PRODUCTION

200%

YES

300%

With This New Automatic Infeed Grinding Attachment



Utmost precision in grinding and duplicate sizing. Sizing dial is graduated in (.00001) one hundredth of a thousandth of an inch. No hydraulic checking cylinder to change feed rate when oil is cold. No checking of oil level or refilling of hydraulic checking cylinder. Three (3) different feed rates are available in one unit for the fastest, most efficient, and precise sizing in a centerless grinder.

CAN BE USED FOR TRU-FEED AS WELL AS INFEED for close sizing. Ideally located push button control station consists of Stop-Button, Caution Pilot Light, and a selector switch for set up or auto grinding positions. **CATALOG — Write for it today!**

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Subsidiary of

TWENTIETH CENTURY MFG. CO.

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Open Territories for Manufacturers' Representatives

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Guest Editorial

Product Boycotts

By W. B. THOMAS
Thomas Associates

● Comedian George Gobel usually gets a bevy of belly laughs when he impishly wisecracks: "You can't hardly get them no more."

When Gobel says it, it's funny. When it happens in real life, it's tragic—especially when a private organization is helping to keep goods and services off the market.

Many persons are unaware of a power to limit the public's freedom to buy the products it wants or to hire the workmen it wants. Yet such power now exists in the hands of certain labor union officials. Not all union officers would use it, but enough have taken advantage of it to make corrective legislation mandatory.

The American public is hit by all sorts of hidden product boycotts. Manufacturers, wholesalers, and retailers are all brought into the picture at one time or another. There is no boundary line for the kind of product or the type of service that can be hit.

The Painters' union has its restrictions on the use of multi-color paint, on the use of spray painting, and the size of paint rollers.

Why certain products can be kept from use and why certain persons can be prevented from doing a particular type of work is the result of loopholes in our national labor laws.

When the Taft-Hartley act was passed in 1947 one of the foremost problems was to put an end to the secondary boycott. Congress made the secondary boycott an unfair labor practice by unions, and thought it was bringing an end to this tactic.

But the law contains loopholes and the secondary boycott is still with us. Today we have legal and illegal secondary boycotts; the legality is determined by the technique the union official uses in employing the unfair weapon.

The boycott can take two forms—a product may be its direct target or the employee who makes or services the product may be its immediate victim. The general public is the eventual victim.

A current major product boycott is the campaign of the United Rubber Workers of Akron, Ohio, to keep O'Sullivan heels from being worn by Americans.

This boycott is the result of a contract dispute between the United Rubber Workers union of Akron, Ohio, and the O'Sullivan Rubber Co. of Winchester, Va. The union no longer represents O'Sullivan's employees, but the boycott continues.

Boycotts against workmen in the service field are numerous. In the St. Louis area for example, certain unions prevent a contractor from hiring a particular craftsman directly. The contractor must first hire a sub-contractor to get the craftsman.

In Baltimore a small steel erecting company that employs union labor exclusively has boycott problems. Union officials do not want this firm to do business with non-union general contractors.

The loss of choice from a secondary boycott is not merely a restraint upon purchasing. It sometimes limits the right to make and sell a product.

A Kansas City, Mo., firm, the E. K. Campbell Co., has difficulty in having its large warm air furnaces installed in Long Island, N. Y., school buildings unless the casings bear the Sheet Metal Workers label. The Campbell Co. not only employs union labor, but operates under a union shop contract.

The product boycott is another demonstration of the monopoly power of labor union officials. It will not be stopped until the power of the professional unionist is curbed.

Many members of Congress are aware of the secondary boycott problem. Senator Curtis (R-Nebr.) has termed it the most vicious of union unfair labor practices, second only to violence. He has introduced legislation to close the secondary boycott loopholes in the Taft-Hartley act.

Action by Congress, however, is proportionate to the action taken by the constituents of congressmen. In other words businessmen and the public must not only ask but insist upon relief.

The alternative to inaction is obvious: "You can't hardly get them no more."

W. B. Thomas

Mr. Thomas is the senior member of Thomas Associates of Cleveland, Ohio, a firm engaged in the professional management of business associations.

American Society for Abrasives

Detroit Chapter

We are now including the second message from the March 26 ASA meeting which we did not have space for in our June issue. Fred Upper, from the Bonded Abrasive Division of Carborundum Co., Niagara Falls, N.Y., was the second speaker of the evening.

EFFECT OF MOUNTING ON GRINDING WHEEL SAFETY

By **Fred Upper**

One of the indignities that grinding wheels are sometimes subjected to is improper mounting. This may not occur too often in the same place, as the wheel, machine, and the operator will sooner or later be put out of commission unless the condition is corrected.

The ASA safety code spells out in detail the correct mounting conditions. The wheel manufacturer puts as much of this on the wheel blotter as there is room for. I would like to show some slides to illustrate a few basic principles.

1. **Area of Greatest Stress on the Wheel.** An important thing to remember is that the area of greatest stress on a wheel in use is at the arbor hole. Care must therefore be taken that the stress at the arbor is not increased by improper mounting.

2. **Fit on Machine Arbor.** The wheel should fit freely on the arbor—rather too loose than too tight. Too much clearance on the machine arbor will cause the wheel to be out of round initially, but will not materially affect its balance once it is trued concentric.

3. **Flanges.** Flanges should be of equal diameter and at least one-third of the wheel diameter. The back flange must be keyed to the shaft, otherwise the flanges will turn on it in use. This would cause excessive tightening of the nut.

4. **Tightening the Nut.** The nut that holds the flanges against the wheel should be tightened on sufficiently to prevent the wheel turning in use. Care should be taken not to spring the flanges through excessive nut pressure. Sprung flanges cause excessive stress on the wheel at the arbor hole.

5. **Mounted Wheels.** This type of wheel does not have an arbor hole and therefore it is not stressed at this point. Wheels should be chucked in the grinder with as little overhang as practical for the operation.

6. **Blotters** serve two main functions: (1) They act as a gasket between wheel and work and keep the pressure constant between the flanges and the wheel. (2) The blotters fill the voids in the wheel and thus give greater bearing surface between wheel and flanges.

7. **Regular Inspection of Wheel Mounts.** It is highly desirable to have a regular schedule for inspection of arbors and flanges. Preventive maintenance avoids accidents.

8. **Safety Guards.** Having made certain that mounting practices are under control, always use safety guards for that added protection.

DETROIT CHAPTER—"Progress in the Art of Grinding" was the panel presentation by four Cincinnati Milling Machine Co. men at the May 28 meeting. They are left to right: Hayward Gay, M. W. Gormly, Robert Fisher, and W. Kent Mathias.

The April meeting was held at the Micromatic Hone Corp. plant in Detroit. Kenneth Conners, Chairman of the Board of Directors of the corporation, who came to the meeting on one of his infrequent trips from California, related his experiences from the time he first started selling the theory of honing to its present acceptance.

Ken Blakes, President of Metalloid Corp., and Doug Keith, in charge of Research and Development at Micromatic, also were speakers. Mr. Blake's and Mr. Keith's talks are covered in abbreviated form in this issue.

STOCK REMOVAL

By **Ken Blakes**

Removing stock with an abrasive grain or removing stock with a single point cutting tool makes no difference as far as the mechanism of removal is concerned. In either event, to take the chip from the surface the stock requires a change in the physical properties of the material which is brought about by a certain relationship of energy exchange.

By changing the physical properties, you are grinding or honing or attempting to cut with a single point tool, steels of high hardness. You could not conceive of removing a chip from a piece of steel in the 60 plus Rockwell C category in plastic flow unless the hardness

or the physical properties of the particular metal at the point of shear had been altered.

Actually, that is what happens—it happens in soft metals, in hard metals. The concept we have had for years, that is, in the case of abrasives, the stock was removed by the differential in hardness and because of the differential in hardness the grain is able to penetrate the material and dig out a piece of the metal. Unless you can alter the physical properties of the material, it's impossible for the grain to penetrate and remove a chip.

So all of these processes of chip making obey the same set of basic physical rules. Now that relationship is a relationship of energy, volume, and time. In other words, if we wish to reduce the physical properties of a piece of steel, we must bring the temperature of the material which is being disturbed, from which the chip is being taken, to the point where the yield strength is reduced to the plastic flow point. If we consider how that happens, it can only happen by a rise in temperature.

So where do we get the temperature? We get the temperature by causing an exchange of energy to occur between the grain or the cutting tool with the metal in such a manner that the energy which is absorbed by the workpiece is converted largely to heat. We know by actual measurement that value is approximately 97% or 98%. Now the result of the conversion to heat brings about this change. It obeys the same rule as if you were placing a container of water over the hot plate or a bunsen burner and measuring the rise of the temperature in a given length of time.

If you maintain the heat at constant and the volume of water at constant, you will get a certain number of degrees in a minute. If you double the volume of water and allow the heat output to remain constant, your rise in temperature will be half as great. It's an energy, time relationship.

Slides then shown by Mr. Blake were taken from schematic drawings to show how the grain accomplished its purpose and what the difference is in the various factors due to the process.

MICROHONING

By **Doug Keith**

My subject is going to be microhoning, which I will divide into three sections: what it is, what it does, and what it accomplishes. Honing may be described as a method for removing materials by the use of a number of abrasive sticks, letting your arc of contact area with low-unit stress act at low velocity.

We have adopted the term "microhoning" as a tradename for our process. Microhoning has been adopted as a major metal cutting process for industries such as the automotive, refrigeration, aircraft, as well as the antifriction field.

First, what microhoning does. To begin with, it removes stock, almost any amount from one ten thousandths of an inch to ⅛ of an inch. It depends, usually, on the errors in previous operations as to how much we would have to remove to correct those errors. Secondly, it characterizes the work. What I mean by characterization is that it puts on the surface of the workpiece a cross-hatch finish, the trademark of a particular process. It puts it on at various angles, displacements, and puts it on circumvently. We call it directional finish usually in the direction of most of the mating parts. We apply this surface characterization on cylindrical as well as flat pieces.

Various grits are selected which work well in materials soft, hard, very very hard, as the case may be. These grits may be aluminum oxide grits and the silicon carbides, also the diamond abrasive grits.

The important part of our process is that our abrasives are dressed automatically by stroking back and forth and gradually honing the segment. Microhoning leaves the process free and clean of fragment material often referred to as amorphos.

The grain size varies with the operation used, starting in the size of the 120 grit and going up to the flour grit.

Now as to what microhoning accomplishes. First, it makes parts geometrically accurate. It is considered first and most important in the mechanical efficiency. Secondly, it produces parts having a surface finish of the character which promotes closer fits that are lubricated. There is also the reduction of wear. Thirdly, it holds tolerances to a millionth of an inch when needed, by their diametrical size, tolerances, diametrical straightness or accuracy.

Microhoning can produce any degree surface finish. We are limited oftentimes to the porosity of the base material itself. It gets down to the point where we can pick up on a profilometer the porosity of the material instead of the finish. On the other hand, we are limited in the field of hard parts, hard surfaces, by the inability of honing stones to produce a very rough surface, I would say in the 62, 64 Rc. Perhaps we could get 20, 25 microinches as a very rough finish.

The May 28 meeting was held at the Ford Executive Conference Room with "Progress in the Art of Grinding" as a panel presentation by The Cincinnati Milling Machine Co. The welcome and introduction were brought by D. J. Davis, Vice-President and Manufacturing Research for the Ford Motor Co. Ten-minute topic talks were undertaken by four Cincinnati men, with question-and-answer periods following each subject the speakers covered.

The speakers and their topics are as follows: Maurice W. Gormly, "What Is Grinding Research?"; Robert C. Fisher, "The Wheel and Its Application"; W. Kent Mathias, "The Machine and Related Developments," and Hayward A. Gay, "A Candid View of the Present and Future of the Art of Grinding."

The June 25 meeting was scheduled to be held at the Plum Hollow Golf Club, with dinner and dancing for members and their guests and their ladies.

Long Island Chapter

Wheatley Hills Tavern in Westbury was the gathering place for the June 10 meeting of the chapter. "Modernized Deburring" was the topic under consideration for the program, with the speaker, Edward P. Fisher, Industrial Sales Engineer, Osborn Manufacturing Co., Cleveland. The subject covered the important contribution the company has made in burr removal and surface finishing. The cleaning of metals in preparing them for subsequent plating and painting operations was also discussed.

No meetings were scheduled for July and August.

Reprints Available

Better Diamond Dressing for Precision Grinding
Effects of Materials on Snagging Wheel Performance
Flap-Type Coated Abrasive Wheels
How Good Are Man-Made Diamonds?
When and How You Can Use Crush Form Grinding
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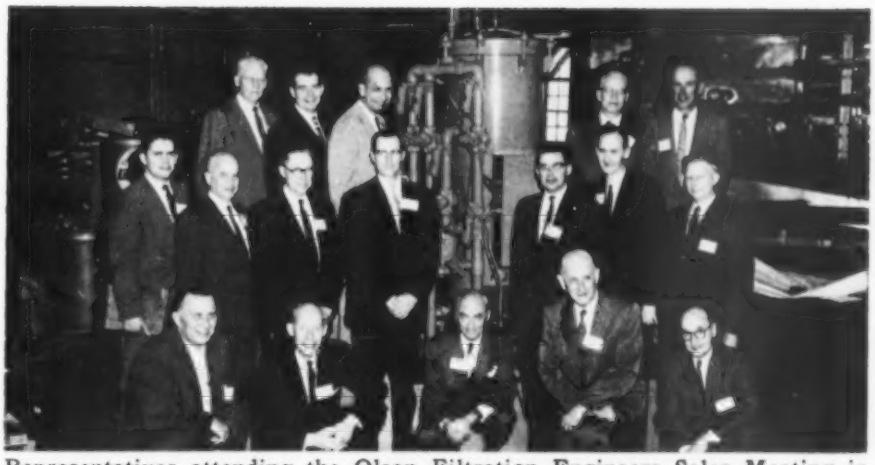
News from the Industry

Olson Filtration Engineers Introduce New Automatic Filter

The new Olson automatic filter, reportedly the first of its kind ever developed for industrial applications, was announced at a sales meeting held recently by Olson Filtration Engineers, Division of The American Laundry Machinery Co., Cincinnati, Ohio. Representatives from the eastern and midwestern territories attended the two-day session conducted by Randall E. Mitchell, Olson Division Manager.

According to Mr. Mitchell, the new Olson automatic, pressure-type filter guarantees positive filtration down to ½ micron, at costs as low as .00015c per gallon.



Representatives attending the Olson Filtration Engineers Sales Meeting in Cincinnati are shown here grouped around the new Olson automatic industrial filter. From left to right, top row, are: A. E. Donker; C. E. Slaughter; J. W. Peterson; R. A. Smith, and Jay Korest. Middle row: D. W. Donker; R. E. Lee; S. L. Powers; N. Williams; Allan Korest; R. E. Wiegand, and A. A. Armstrong. American Laundry Manufacturing Co. personnel, bottom row: G. B. Knapmeyer, Project Engineer; R. E. Mitchell, Mgr. Olson Division; R. Anthony, Vice-President-Marketing; C. E. Trotter, Executive Assistant, and E. H. Spreckelmeier, Chief Electrical Engineer.

Sales Up Over '58 on Van Norman Grinders

Sales of Van Norman centerless grinders, for the first quarter of 1959, exceeded sales for the entire year 1958, according to J. E. Storm, Vice-President and General Sales Manager of Van Norman Machine Co., Springfield, Mass., Division of Van Norman Industries, Inc.

"Machine tool sales are definitely going up. . . . There's an overwhelming desire on the part of industry, our customers, to increase production and lower costs. Our new Van Norman Diversimatic centerless grinder and the new No. 746 Versi-Matic milling machine, designed for production, capable of utilizing the latest numerical controls, will do just that. . . ."

A.I.T. Diamond Tool Co. Constructs Plant Addition

The A.I.T. Diamond Tool Co. announces their new spacious plant adjoining their present plant at 8221 N. Kimball Ave., Skokie, Ill., which is to be known as Plant No. 2. This structure will house the research and development division, additional production facilities, new executive offices, and a large demonstration and schooling section which will be known as the Dia-Mo-Rama Room. This room will feature various types of grinders for all applications, and both conventional and electrically assisted machines will be in readiness for those desiring information on new applications. The research and development lab adjoins this room. The upper level Glass Room contains large offices.

Torit Mfg. to Occupy New Plant in Early Fall

A new plant to consolidate operations now carried on at three separate locations for Torit Manufacturing Co., St. Paul, Minn., is nearing completion. Enlarged laboratory and engineering facilities will consolidate Torit's research, test and development activities and provide improved facilities for dust measurements, filter resistances, air flow characteristics, and other dust collection studies.

Diamond Research Laboratory Announces Lab Results On Improved Diamond Grit

In a paper presented at the annual convention of the Industrial Diamond Association of America, R. G. Weavind, Director of Research for the Diamond Research Laboratory at Johannesburg, South Africa, announced a new method of selecting natural diamond boart particles for use in resinoid diamond wheels. The laboratory tests indicate that irregular or rough-surface diamond grit rather than the smooth blocky particles will give resinoid bond grinding wheels up to 40% greater efficiency than conventional natural diamond wheels.

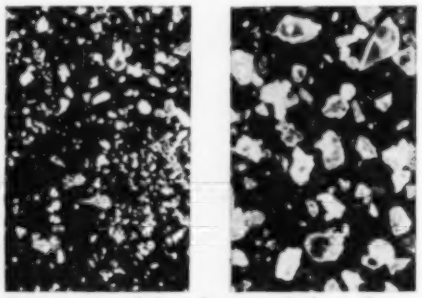


Photo on left shows sludge from grinding with the new friable natural diamond boart. Photo on right shows sludge from grinding operation using conventional natural diamond wheels.

It was found in tests that the more friable material was better adapted for use in resinoid bonds because the smooth natural diamond particles were more often torn from the soft resin before their full benefit was realized.

The tests also revealed a difference in the hardness of carbide. The resinoid wheels showed maximum efficiency in the hardest part of the carbide or near the surface. Mr. Weavind emphasized that for harder bonds (metallic and vitreous) the stronger, blocky shapes are still superior. Selected natural diamond boart for use in resinoid wheels will be available to users some time in the future.

Industrial Diamond Assn. Elects New Officers

The Industrial Diamond Assn. of America, Inc., Pompton Plains, N.J., at its 14th Annual Meeting and Convention in Williamsburg, Va., May 11-14, elected the following officers to serve for the coming year: **Donald J. Wallace**, Wheel Trueing Tool Co., Detroit, President; **Bernard Jolis**, U.S. Industrial Diamond Corp., New York City, First Vice-President, and **Leopold H. Metzger**, Super-Cut, Inc., Chicago, Second Vice-President.

Directors elected for the following two years were: **Charles Baumgold**, Diamond Tool Research Co., Inc., New York City; **Donn E. Stone**, J. K. Smit & Sons of Mich., Inc., Grosse Ile, Mich; **Jan Taeyaerts**, Precision Diamond Tool Co., Elgin, Ill., and **John Van Itallie**, The Van Itallie Corp., New York City.

The outgoing President, **Morris Winston**, Diamond Drill Carbon Co., New York City, will also serve as Director for the coming year.

After 27 years in technical-optical manufacturing, **Davidson Mfg. Co.**, West Covina, Calif., announces a company

THE NEW WAY TO CUT WELDS

ZEPHYR WELD SHAVER

Zephyr's Weld Shaver cuts and finishes medium weld beads in one operation. One pass of this lightweight tool mills flat, concave and convex weldments to within 0.001" flushness. Invaluable in plants which require precision weld finishing. Two tested models available: ZT508 for stainless steel and other hard alloys; ZT509 for aluminum and other soft alloys. Carbide and steel cutters sold separately. *Ask for catalog.*

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SIA throughout the world

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name change to **Davidson Optronics, Inc.** Rapid expansion of the firm in combination of electronics with optics led to choice of the new name.

Don E. Davidson is President of the new corporation. Three separate divisions of manufacture will be: Military Products, Instruments, and Photographic Products.

Black & Webster, Inc., Newton, Mass., have announced that they and their three affiliates, **Edward Blake Co., Inc., Black & Webster Sales, Inc.**, and **Nylogrip Products**, all of Newton, Mass., will be operating from their new quarters at 570 Pleasant St., Watertown, Mass., on June 29, 1959.

The Producto Machine Co., Bridgeport, Conn., has appointed **Clint Helton and Co.**, 142 Broadway, Denver, distributor for Colo., N. Mex., Wyo., and part of S. Dak.

The **W. C. Harper Co.**, Cincinnati 37, Ohio, has been named as representative in the southern half of Ohio and neighboring Kentucky counties for **The Whiton Chuck Division** of **The Whiton Machine Co.**, New London, Conn.

Besley-Welles' L.A. Branch

Besly-Welles Corp. of South Beloit, Ill., has opened a new combination branch office and warehouse at 3224 Union Pacific Ave., Los Angeles 23, to stock its complete line of cutting tools and gages. The new facilities contain 4,000 sq. ft. of floor space.

Dia-Chrome Moves to New Quarters

The Dia-Chrome Co., developers and manufacturers of the original diamond coated steel tools, has moved to new quarters at 612 W. Elk Ave., Glendale 4, Calif. Additional equipment will help meet the demands of the reinforced plastic, ceramic, and glass industries, as well as new materials for aircraft, electronics, and missiles. A new experimental and production division is being formed, also consulting services offered.

Glendale Optical Establishes Warehouse on West Coast

H. V. Gates

The newly-formed **Fibre-Metal Pacific Co. Inc.** is taking over distributorship of the products of the **Glendale Optical Co.**, Valley Stream, L.I., from the **K. W. Distributing Co.** Fibre-Metal Pacific will occupy the same warehouse and office space formerly used by K. W. at 7332 S. Garfield Ave., Bell Gardens, Calif., and will represent Glendale in Nev., Ariz., Ore., Wash., Idaho and Utah, as well as in Calif.

H. V. Gates, a veteran of more than 15 years in the industrial safety and welding fields on the West Coast, has been appointed to head the new distributorship as General Manager.

Mr. Jean L. Lewis has been named Technical Director for the Eli Sandman Co., Worcester, Mass. The company supplies resin coated reinforcing material for use in reinforced grinding and cut-off wheels.

ACCURACY .0002 T.I.R.

.0002 T.I.R. or less at Spindle Nose, .0005 T.I.R. or less on Test Arbor six inches from Spindle Nose

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

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USE THIS NEW KIND OF DIAMOND CUT-OFF WHEEL

Gives narrower, smoother cuts on industry's toughest materials

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Now . . . at *production prices* . . . DIATRONIC gives you a rim width of .006" that's accurate to a maximum total tolerance of .0005"—or your money back. This accuracy is built in by a new process. No break-in needed. New narrow cut reduces sawdust loss 30%. A must for $3,000-a-pound silicon or germanium crystal. Cuts tungsten carbide, corundum, aluminum oxide, glass . . . practically anything. Stock orders shipped in hours; special wheels available. Write for literature, price list.

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DIATRONIC* DIAMOND WHEELS

"with built-in tolerance" *TRADEMARK

Bay State Abrasives Elects New President

Arthur E. Gilman was elected President of the Bay State Abrasive Products Co., Westboro, Mass., it was announced by the company's Board of Directors following their annual meeting.

A. E. Gilman

Previous to his affiliation with the Westboro company in 1941, Gilman was associated with the Commercial Investment Trust Corp., New York City, and an instructor at Becker Junior College, Worcester, Mass. At present he is a special lecturer at Worcester Polytechnic Institute's Evening School of Industrial Management, Worcester, Mass.

Gilman was elected Treasurer of Bay State in May 1956, and will retain this position along with the Presidency.

Bixby Elected President of Bryant Chucking Grinder Co.

H. Glenn Bixby was elected President of Bryant Chucking Grinder Co. of Springfield, Vt. at a meeting of the Board of Directors. His election followed the resignation of former President **J. H. Beardsley**. **N. A. Leyds**, with

H. Glenn Bixby

N. A. Leyds

Bryant for six years, was elected to the office of Vice-President and General Manager.

Chester N. Pearsall and **K. Dale Swanson** have been appointed Field Engineers by Norton Co., Worcester, Mass., following their completion of the sales training course. Pearsall has been assigned to the Pittsburgh District Office, and Swanson reports to the Pacific Coast District Office at Los Angeles.

Brown & Sharpe Mfg. Co., Providence, R.I., announces the following appointments:

Charles M. Evans will join the company's subsidiary, Brown & Sharpe Ltd., Plymouth, England, to assist **Willard Spence** in the general management of the British subsidiary. Evans will be succeeded in Providence by **Duncan H. Doolittle. A. Dean Hunter** will be Division Superintendent-Machine Tool Division. **W. G. Leonard** will assume the position of Superintendent-Screw Machine Group, and **J. F. Rowley**, Superintendent-Milling and Grinding Machine Group, reporting to the Division Superintendent.

Eli Lilly and Co., Indianapolis, Ind., has reorganized its Industrial Products Department by establishing eastern and western sales regions. **Neil E. Funk, Jr.**, has been named Manager of Industrial Sales in states west of Ohio, and **Raymond Means** in Ohio and eastern states.

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Moderate Size, New England, desires tool designer with experience in field. Should also have some knowledge of wheel manufacture and formulae. Flat salary, excellent opportunity for bonuses. Reason for opening, death.
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FOR HOT and COLD SAWS
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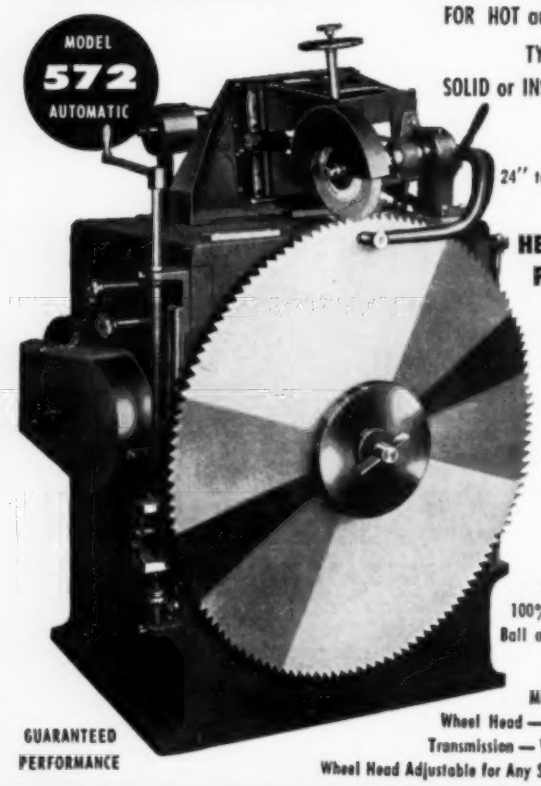

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R. M. Toucey has been appointed by American Air Filter Co., Louisville, Ky., as its exclusive representative in the Pittsburgh area for its Herman Nelson unit ventilator products for schools, Herman Nelson heating and ventilating products, and its Illinois Engineering Division heating systems and controls. His office is located at 306 Beverly Rd. (P. O. Box 8051).

Obituary

Elmer Ellstrom, Sr., son of the inventor of precision gage blocks, and himself founder of Dearborn Gage Co., was buried in Northview Cemetery, Dearborn, following services on May 13. Ellstrom, 72, was born at Fagersta, Sweden, on December 22, 1886. Although nominally retired since 1953, he remained active in the affairs of the company he founded until his death on Sunday, May 9.

Edward C. Maguire, 69, President and Founder of Maguire & McLernon, Inc., Baltimore, Md., died on May 18. He founded his industrial distributing company in 1946 after 33 years' service with the Carborundum Co.

Herbert W. Hansen, Eastern Sales Manager, The Producto Machine Co., Bridgeport, Conn., passed away April 10, 1959, at the age of 54. He was an active member of the Southern Connecticut Chapter of the National Tool & Die Manufacturers Association, and the Fairfield County Chapter of the American Society of Tool Engineers.

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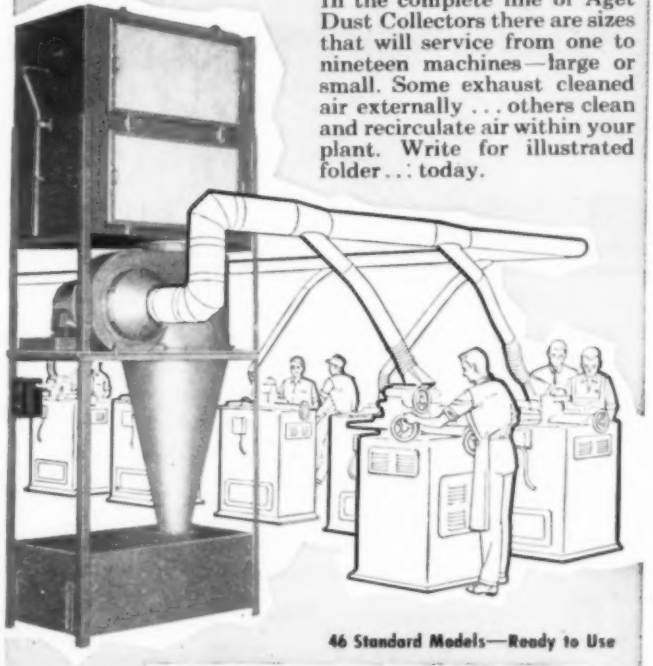

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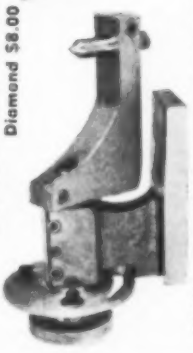

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- Wheel grinds cooler—does not fracture carbide
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Electro mechanical models produced by one of Europe's largest grinding manufacturers—completely universal with swinging internal grinding heads. 014" x 1" O.D. Wheels.

11" x 20"	$3600.00
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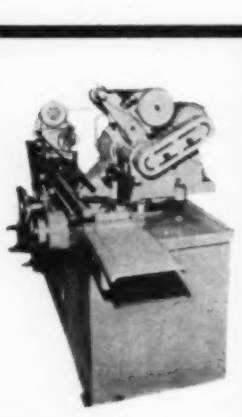
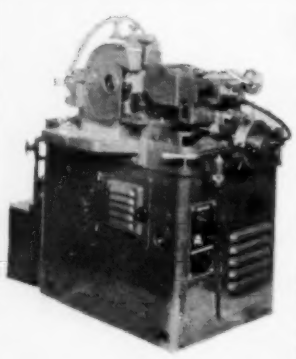
11" x 42"	$3950.00





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MODEL 0 Work diameters .012"-⅝" $2250.00

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NEWS OF INDUSTRY *continued*

E. O. Eagle

Eugene O. Eagle of 302 S. Tremont Dr., Greensboro, N. C., has obtained a franchise for the distribution of products manufactured by the Schaffner Mfg. Co., Inc., Pittsburgh. Eagle will exercise his franchise in the states of Virginia, North Carolina, and South Carolina.

W. R. Swick

William R. Swick has been appointed Assistant District Manager in the New York area by The W. W. Sly Mfg. Co. of Cleveland. He will work out of the company's branch office at 26 Journal Square, Jersey City, N.J. Swick has been in the company's home engineering office for two years, working primarily in the areas of new product development and sales engineering.

W. W. Skaggs

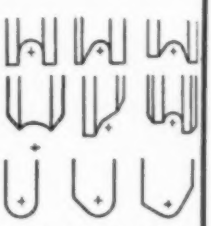
Wallace W. Skaggs, with the Atkins Saw Division for 25 years, has been appointed Branch Manager of the Portland, Ore. facilities of this division of the Borg-Warner Corp., Indianapolis, Ind.

WHY WASTE TIME?

Dress Profiles like these in a few minutes without Templates or Crusher Rolls with the Jeon Automatic Angle Tangent to Radius Dresser. It's fully universal.

Patented

CONCAVE DRESSING TOOL



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33 Box Street **Brooklyn 22, N.Y.**

Our reclaiming department salvages diamond powders from wheels, sludges, hones, saw blades, cotton wastes or any type of diamond bearing material. We will submit quotations on an analysis basis.

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Don't Miss these Features

GRINDING and FINISHING

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20 Techniques in Flat Polishing
A thorough-going analysis of the problems encountered in flat polishing operations, with their solutions.

26 Grinding the Lick Observatory Mirror
An unusual application story combining substantial stock removal with precise finish in glass grinding.

28 Portable Wet Vacuum Cleaner for Safer Magnesium Grinding
A case report of a safe system for disposing of flammable magnesium grinding swarf.

30 Controlled Vibration . . . New Angle in Loose-Grain Finishing
Continuous motion of parts, media and compounds in a vibrating container speeds up processing.

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Another example of the benefits of clean coolant.

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Guest Editorial

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Gaging for Grinding
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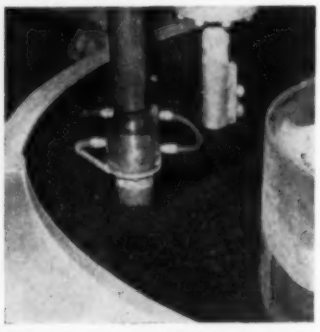
Finishing Aluminum Panels for the Air Force Academy
The finishing of large aluminum panels presented new problems for the manufacturer. One large drum sander proved to be the answer to these problems.

Snagging Stainless Steel Slabs
Innovations in snagging machine design and larger motors provide for increased rates at a large mill.

Whirlpool Solves Grinding Problems on Small Compressor Part
Vanes of a compressor used in the refrigeration equipment must last forever. This presented problems which were solved through intelligent grinding methods.

Here's how ALMCO's New Spindle Finishing Process gives precision finishing of complex components...

1 Operator air-chucks part to be finished to spindle after having just released the finished part.



2 Part is lowered into high velocity stream of abrasive media. Spindle rotates while in stream.

3 Index head carries spindle thru tub of abrasive media until it again reaches operator's station. Water rinses media away.

4 Result: fast and even action! In most cases, 0.005 to 0.015-in. radii can be generated on hardened gear teeth in 2-4 mins.

...and on a continuous production line basis!

The ALMCO Spindle Finishing Process now makes possible precision finishing of complex, high-quality components such as gears, bearing cages, spline shafts, pump rotors, jet blades, etc. . . .

- *at production rates heretofore not possible . . .*
- *on a continuous production line basis . . .*
- *and with all surfaces receiving the same controlled amount of precision finishing!*

Here's how it works. Large parts or clusters of smaller parts are chucked directly to the spindles from a single operator's work station. Spindles lower the parts into a high velocity stream of abrasive media contained in a tub that rotates at a controlled speed of from 275 to 600 sfpm at the spindle center line. Spindles themselves also rotate at 13 rpm while in the abrasive stream, while the indexing head slowly carries all spindles in a 1 to 9 minute trip around the tub. Operator merely removes and replaces parts on spindle chucks as they appear before him. Models are available with automatic or manual indexing, 2 to 16 spindles, tub diameters of 48" to 90", and drives of from 5 to 30 hp.

For Full Story on ALMCO Spindle Systems and on free processing of sample parts, write for ALMCO Album of New Products!

ANOTHER REPORT FROM THE ALMCO ALBUM OF NEW PRODUCTS

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A Final Thought

Automation and Unions

Discussing labor and unions is an almost impossible task. They cannot be separated from the larger aspect of our industrial life. Profit and loss, racketeering, greed and avarice, shyster business practices, noble ideals and advanced humane business thinking are so interlocked that any broad discussion degenerates into trite generalities. Consequently, we want to discuss only one phase of the subject, one important contribution unions have made in our way of industrial life.

The unions gave automation a big push and they're continuing to push with mighty effort. This was brought home to us vividly just the other day when a process engineering chief said, "Our biggest concern is the deployment of labor. The equipment as such, that is, the technical end of it, is really secondary to how many man-hours will be saved. We would rather install a brand new method, or automated units, than improve an existing one. Only by having a new method can we retime the job and realize the benefits inherent in the new equipment."

In another shop we saw a 150 thousand dollar grinding line which replaced six machines and six operators. "Figure it out," said the engineer in charge, "at ten dollars an hour machine time, times 2000 hours per year, times six men, is equal to 120 thousand dollars a year. It won't take us long to get our money back. And we get a better quality and have less headaches. We will soon have a fighting chance to beat foreign competition."

And there we have it in a nutshell: The need for low production costs, stable output, unvarying quality and no headaches, results inevitably in substituting the machine for the muscle.

Now, we may not like this, and some may wish to arrest this trend toward mechanical muscles, but the fantastic growth of numerically controlled machines in only the last two years will convince us that change cannot be halted and that the substitution of the machine for expensive labor will continue. Labor itself will see to that.

This displacement of labor has already resulted in a changed over-all labor force. There are more engineers today than yesterday (and increasing yearly), white collar workers have increased as production workers have decreased, the service industries have expanded and, in general, the old order changeth.

And for the future? Unskilled labor will almost disappear, the skilled mechanics will primarily be in our tool and die shops, others will become specialists in their own way, operating automated or numerically controlled equipment. And the paradoxical thing about it all is that the unions themselves, albeit unconsciously, through their continuing wage demands, have fostered this situation. For the country, and for the labor force, this will, in the long run, be a good thing. For the unions this will eventually result in the lessening of power and authority. There is no need to brand automation a culprit; it was a necessary outgrowth of a set of circumstances. There is a law of causality in all things; unions, business, labor and the general public are not exempt from this law.

Wm. J. Schleicher

Vice President & Editorial Director

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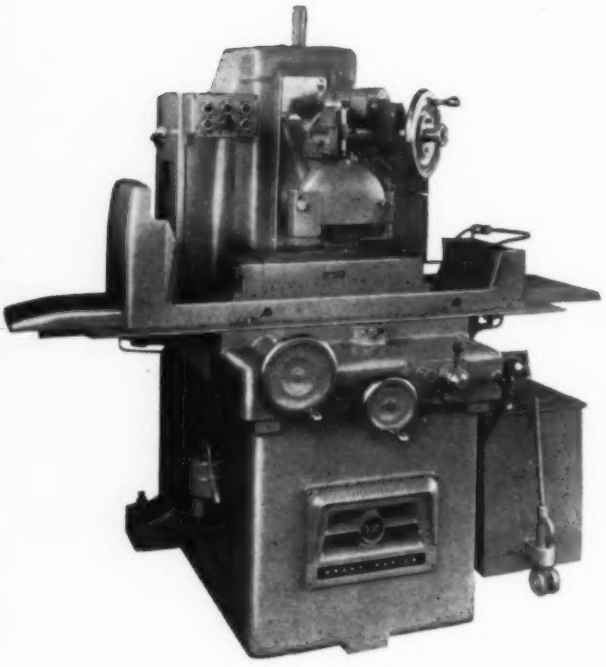

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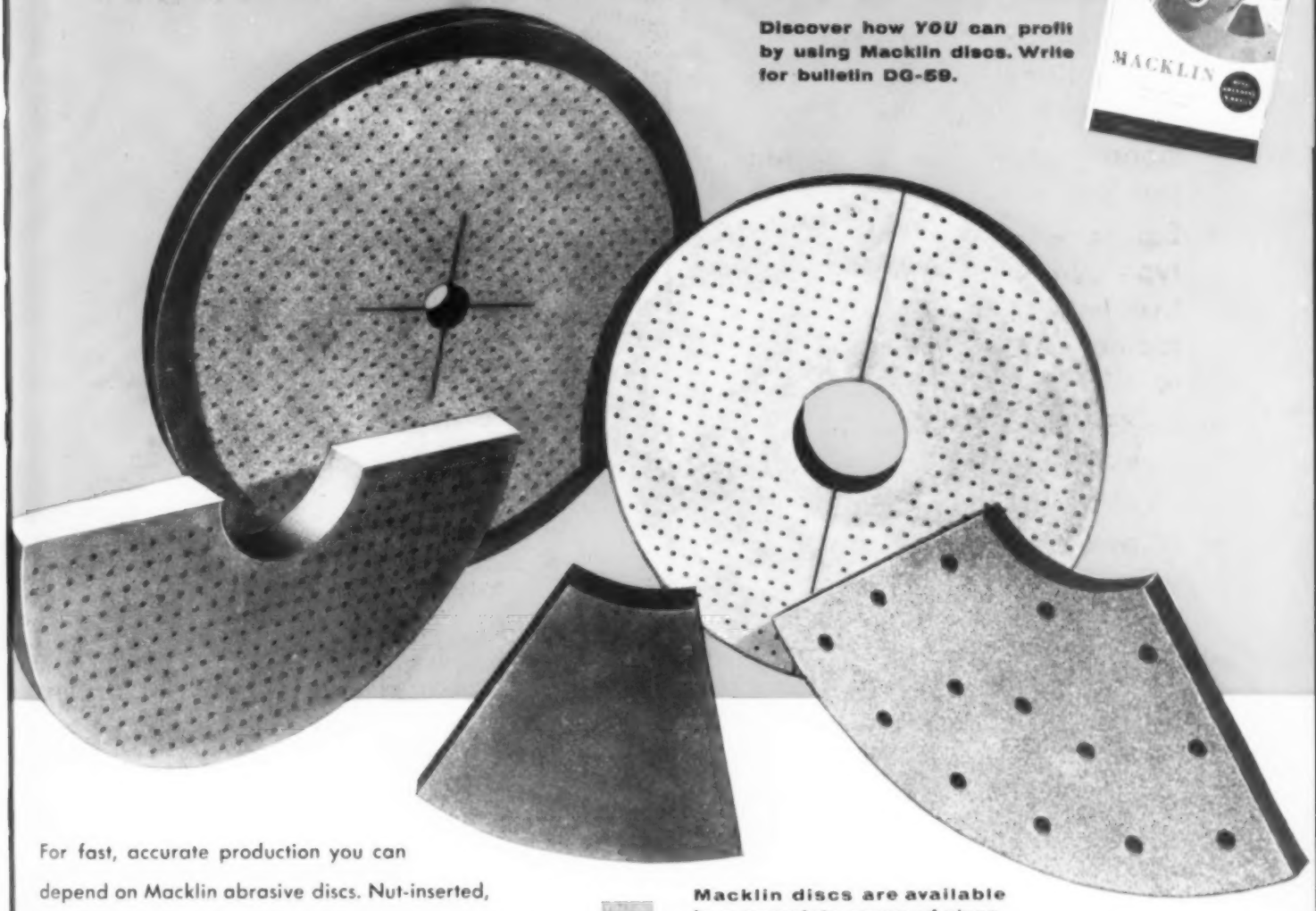

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